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The effect of extended wear contact lenses on corneal thickness and the endothelial layer

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Abstract

Corneal thickness and the corneal endothelium were measured and observed during the extended wear of high (74 %) water content, medium (55%) water content, and low (38%) water content contact lenses. Thirty-nine patients were monitored for a five month period. Two different water content contact lenses were worn by each patient. The results of the study indicate no significant change in corneal thickness occured with any of the lenses . Endothelial cell density was not effected by any of the different lenses, but morphological changes, increased polymegathism, did occur with all. The degree of successful wear of extended wear contact lenses will vary among individual subjects. Only nine (23%) of the subjects were recommended for continued extended wear at the end of this study.

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THE EFFECT OF EXTENDED WEAR CONTACT LENSES

ON CORNEAL THICKNESS AND THE

ENDOTHELIAL LAYER

Place: Pacific University

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The opinions or assertions contained herein are the private views of the author and are not to be construed as official or as reflecting the views of the Department of the Army or the Department of Defense.

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ABSTRACT

Corneal thickness and the corneal endothelium were measured and observed during the extended wear of high (74%) water content, medium (55%) water content, and low (38%) water content contact lenses. Thirty-nine patients were monitored for a five month period. Two different water content contact lenses were worn by each patient. The results of the study indicate no significant change in corneal thickness occured with any of the lenses. Endothelial cell density was not effected by any of the different lenses, but morphological changes, increased polymegathism, did occur with all. The degree of successful wear of extended wear contact lenses will vary among individual subjects. Only nine (23%) of the subjects were recommended for continued extended wear at the end of this study.

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INTRODUCTION

Extended wear contact lenses are worn by approximately five million Americans and account for approximately 35 percent of the soft lens market with sales expanding rapidly.[1-3] The safety of extended wear lenses is of principal concern among the nation's eye care providers.[2,4]

Extended wear contact lenses are manufactured today by 18 United States manufacturers with several more presently undergoing Federal Drug Administration approval.[4] These hydrogel lenses range in water content from 32 to 79 percent.

The purpose of this research program was to study the effects of three types of extended wear contact lenses on the eye. The principle objective of the research is the effect that extended wear contact lenses have on corneal thickness and the endothelial layer of the cornea.

This research program was conducted in conjunction with two additional research programs in order to cover a broad scope of extended wear appplication. One of the additional programs investigated the changes in oxygen transmissibility of extended wear flexible contact lenses over time as a result of patient wear. The other program investigated the effects of extended wear contact lenses on contrast sensitivity function with time.

The Armed Forces of the United States are presently studying the use of extended wear contact lens on selected military personnel. The intent of this study is to evaluate

the overall safety of extended wear contact lenses and to provide procedural guidelines for the use of extended wear contact lenses.

Literature Review

Leonardo da Vinci was credited with the concept of the first contact lens in 1508 and in 1888 A. Eugen Fick described the first contact lenses worn by a human subject.[5] The knowledge and research of contact lenses has grown by leaps and bounds since these early attempts. With the discovery in 1960 of hydroxyethyl methacrylate, or HEMA, in Czechoslovakia came the introduction of the soft contact lens. The rights to this material in the United States was sublicensed to Bausch & Lomb in 1966 and was approved by the Federal Food and Drug Administration in March of 1971.[6]

Approximately 120 million people (51% of total population) were using eyeglasses by 1982 and between 16.3 to 18 million (7%) were using contact lenses. It is estimated that 20 million Americans are wearing some form of contact lenses today.[1] The percentage using contact lenses has increased dramatically from 1.3% in 1971 to approximately 7% in 1982.[7]

Soft contact lenses have been used for the correction of refractive errors since their approval by the Food and Drug Administration in 1971. With the approval of extended wear contact lenses for correction of myopia in 1981, there has been an increasing demand for their use.[8] With the increasing popularity of contact lenses and the tremendous advancement in the technology of manufacturing, contact lenses may well overtake glasses in usage.[7] The use of

contact lenses has increased by about 1.5 million pairs per year since 1979.[7] It is estimated that approximately 17.5 million people, about 7 percent, were using contact lenses by 1982 and twenty million Americans are now wearing contact lenses.[1,7] With the large amount of advertisement by the optical companies and the optical chains, the popularity of extended wear contact lenses has exploded in todays' market. The number of optometrists fitting extended wear contact lenses also has increased dramatically in the past four years. In a recent survey it is shown that approximately 90% of optometrists were fitting extended wear cosmetic and aphakic contact lenses.[9] In October, 1984, there were fourteen brands of extended wear lenses approved by the Food and Drug Administration for cosmetic wear while today there are eighteen brands available.[10] Additional lenses are currently under study by the FDA for approval.

There has been an abundance of studies to determine the safety and effects of extended wear contact lenses on the eye.[11-16] These studies have been accomplished by a variety of investigators with a wide assortment of controls. Some individuals are quite adamant in their belief that extended wear lenses are quite dangerous, and should not be fit for the routine cosmetic correction.[17] Others believe the lenses are highly successful.[18,19] It was the purpose of this study to evaluate the safety of extended wear lenses and to observe and measure the changes of the ocular system.

CORNEAL THICKNESS

The first portion of this study dealt with changes in corneal thickness due to extended contact lens wear. Review of the literature shows various studies have been performed in the past few years with mixed results. These range in time from a few hours wear up to several months. Studies also vary in how the lenses were worn, with some wearing continuously and others a matter of a few days before removal.[12-15,20]

In one study of central corneal thickness with permanent (not removed for six months) wear, a thickness increase of 4-6% was found after the first 24 hour adaptation period.[20] The thickness increase of 4-6% gradually decreased to 2.5 -3.1% after a six month period. Patients had as much as 9% increase during sleep, which took three to four hours to reverse after awakening.[20] Another study shows a mean increase of .010mm. after seven months of wearing extended wear lenses.[14] A study of extended wear lenses for thirteen weeks showed no statistically significant difference in pachometry, visual acuity, refraction, and keratometry between the beginning and the end of the study.[15] In another study of seven days continuous wear with three types of lenses, the mean overnight swelling ranged from 9.7% to 15.1%.[13] The mean swelling after the eyes were open for a period of twelve hours was from 1.6% to 5.8%, with the mean deswelling of the eyes over the twelve hour period to be

8.2%. Also included is a study of twenty (20) weeks of continual wear which resulted in no significant evidence of corneal swelling.[12] Larke summarizes his findings as follows[21]:

a. Thick Hydrogel lenses provoke more stromal swelling than thin lenses.
b. The extent of swelling declines with time.
c. The extent of swelling rarely exceeds the maximum amount that can be provoked by anoxia alone (8%). In cases where this is not the case the posterior stroma shows evidence of gross change in the form of 'straie' and folds in Descemet's layer.
d. The use of thin (0.1mm) lenses provokes on average less than one percent stromal swelling.

In reviewing these articles, there appears to be a wide variety of responses recorded.

It was the purview of this portion of the study to record the corneal thickness changes over a five month period on a regular basis and to evaluate the effects of extended wear contact lenses on the corneal thickness. The instrument utilized throughout this research was the Electronic Pachometer. The pachometer system consisted of a slitlamp, a fixation device, an optical doubling device, a potentiometer, and an Apple IIe computer. Further description of the pachometer may be found in the methodology section.

The pachometer is an extremely useful tool in evaluation of the cornea during contact lens wear. A French surgeon named Petit appears to be the first recorded (1723) individual to attempt measuring the thickness of the cornea of the human eye. His measurements were accomplished on

enucleated eyes of cadavers and were found to be about 0.4mm.[22] Physiologist, Blix in 1880 invented an instrument for a measurement in the living eye.[23] Blix' instrument had two identical microscope tubes, horizontally converging at an angle of 40° to a point in front of the tubes.

Gullstrand in 1924, also used the reflection from the two corneal surfaces for his measurements. His system was much more complicated but seemingly more accurate than that of Blix. Tscherning is said to have used the same principle.[22]

The invention of the corneal microscope and Gullstrand's slitlamp were utilized by Hartinger in 1921 to measure corneal thickness. He utilized the corneal microscope and a measurement drum devised by Ulbrich.[22] The corneal microscope was focused on the anterior surface and then on the posterior surface. The difference in the positions was read on the drum and gave the apparent thickness.

Koby and Juillerat also used the slit lamp in their attempt at measurement of corneal thickness. They measured the apparent length of an optical section of the slit lamp beam with an eyepiece micrometer. The real thickness of the cornea was then calculated by a formula that was based on the assumption that the corneal surfaces are concentric.[23] Goldmann in 1932 was apparently the first to use a split ocular to measure the optical section of the slit lamp beam as it passed through the cornea. He used a split ocular similar to the Lobeck eyepiece (a double prism in the plane

of the image of the ocular) and a diaphragm at the site of the exit pupil. In this manner two half images of the cornea are observed contiguous to each other. These are adjusted until they meet, but the hairlines must be kept clear and the refractive error of the observer must be fully corrected.[24]

Von Bahr, in 1948, developed a device based on the principle used by Blix. It allowed simultaneous adjustment of both observation and illumination system, which eliminated the problem of accurate fixation. Von Bahr's appparatus made use of two plane glass lamina which were symmetrically movable about vertical axes in front of the optical systems for both illumination and observation. Only the rays of the lower halves of the optical systems passed through the glass laminae. Thus, by proper rotation of these laminae, one could cause the specular reflection of the corneal surface to coincide with that of the endothelial surface. The rotation of the laminae was proportional to the thickness of the cornea, and from this angle could be calculated the real thickness of the cornea.[23,24]

Maurice and Giardini in 1951 used a modified von Bahr apparatus. They eliminated a number of the objections of the von Bahr instrument. Donaldson in 1965 proposed a split ocular with the Haag-Streit slitlamp to measure corneal thickness. He also concluded that the apparent corneal thickness measurement must be modified by a correction factor to obtain true corneal thickness.[25]

Mishima and Hedbys in 1968 developed a slightly different apparatus utilizing the Haag-Streit slitlamp and the standard Pachometer. The investigators developed the foundation for today's clinical pachometric measurements. They made a modification which allows the exact positioning of the slitlamp at the time of the measurement and an accurate determination of the corneal thickness to be made.[26]

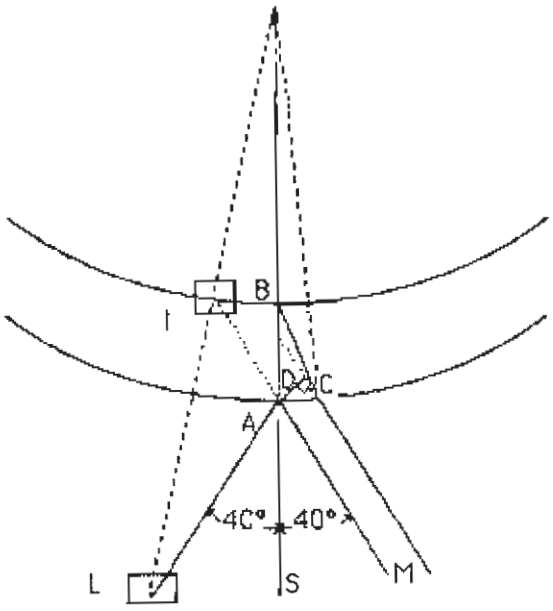
The pachometer consists of a main attachment and split-image eyepiece. The main attachment contains two glass plates, the lower fixed and the upper rotatable, and these plates are placed in front of the right microscope. A thin metal diaphragm with a narrow vertical apperture extends from the main attachment. When the arm of the slitlamp and that of the microscope stand are set an an angle of 35° (the slitlamp at the observer's left of the microscope), the slitlamp beam passes through the vertical aperture of the diaphragm and makes an angle of 40° with the right half of the microscope.

Mishima and Hedbys modification consisted of extending the metal diaphragm approximately twice as long as the original and of attaching two small lamps, pinlites, on this extended diaphragm. The pinlites were placed about 10mm apart from each other on a vertical line.

The principle of the thickness measurement is similar to that described by Jaeger for the determination of the anterior chamber depth.[26] In Figure 1, the light beams (S)

meet the corneal surface at A and the endothelial surface at B. The direction of the beams is perpendicular to the corneal surface. The optical section of the cornea is observed at an angle of 40° from the direction of the slitlamp beams. The endothelium is seen on the extension of line M-C and therefore the apparent thickness of the corneal optical section corresponds to A-D.

Figure 1. The optical arrangement for the measurement of corneal thickness. Light beams meet corneal surface at A and the endothelial surface at B. Optical section of cornea observered at angle of 40° from direction of slit-lamp beams. The endothelium is seen on line extension M-C; thickness of corneal optical section corresponds to A-D (Mishima & Hedbys).



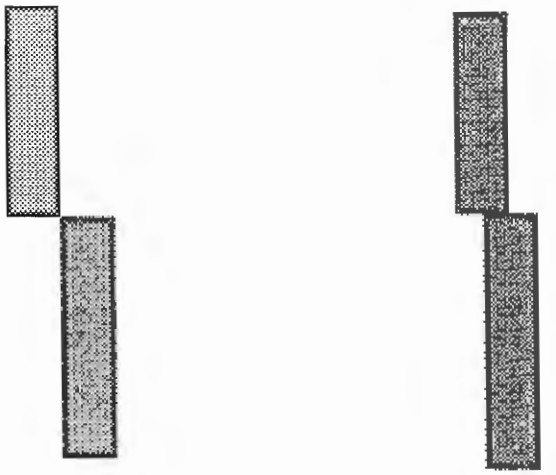
The light beams from the cornea pass through two glass plates and enter the microscope. The split-image eyepiece divides the visual field into upper and lower halves. The light beams which pass through the upper rotatable and the lower fixed plates form the images in the upper and lower visual field, respectively. When the upper glass plate is rotated, the light beam passing through it is displaced by refraction from the original light path, and therefore the upper half of the corneal image is displaced. When the endothelium of the upper half of the optical section is so displaced to be aligned with the epithelium of the lower half, the displacement of the light beam by the rotated glass plate is equal to the apparent thickness of the corneal optical section, A-D of Figure 1. The corneal thickness can, therefore, be calculated from the angle of rotation of the upper glass plate, using the thickness and refractive index of the glass plate, the curvature and refractive index of the cornea.

Mishima and Hedbys modification is used to secure the position of the slitlamp beam perpendicularly to the corneal surface.[26] This positioning of the slit lamp can be made by using images of two pinlites. In Figure 1, the image of pinlite (L) is made at I on the extension of line M-A, when the slitlamp beam is perpendicular to the corneal surface. Therefore, the images of the pinlites are seen on the epithelium of the optical section of the cornea.

Several variables in the measurement of the thickness play an active role in the reliability of the readings. Items such as subject fixation, slit beam width, slit focus, line voltage to the electronics in an electronic pachometer, ambient room illumination, and the subtleties of operator endpoint criterion can change from one moment to another.[27]

Of the above mentioned items, the endpoint of the measurement seems to have the largest influence. It has been shown that there is a statistically significant difference between the touch method and the overlap method (see Figure 2). The touch method is accomplished by having the endothelium of the upper section just touching the epithelium of the lower section.

Figure 2. The touch and overlap methods utilized in corneal thickness measurement during pachometry.



Touch Method Overlap Method

The overlapping measurements were accomplished by having the endothelium of the upper section overlap the epithelium of the lower section. In all cases the thickness indicated by the touch measurement was more than that indicated by the overlap method. It has been demonstrated that the touch technique provides the least variable method.[25] It is further shown that when using a pachometer for corneal studies it is important to realize that only changes greater than one to two percent will exceed the limitations (variability) in measurement and therefore demonstrate a true change in corneal thickness.

ENDOTHELIUM

The next portion of the research deals with the change in the endothelial layer of the cornea during extended wear of contact lenses. The cornea is a transparent avascular structure in which there is a dynamic balance between salt and water, controlled by the endothelial pump, for the maintainance of corneal deturgescence (dehydration). [21,28-30] Several factors can impair the function of the endothelial layer of the cornea. Among these are normal aging, dystrophy and degeneration of the cornea, surgery and trauma. Considering the significance of the endothelial layer of the cornea, it is extremely important to be able to observe and to photograph this critical layer of the cornea.

The endothelial layer consists of a single layer of hexagonal cells having a thickness of approximately 5 micrometers (μm).[21,29] The individual irregular hexagonal cell is normally about 20 micrometers in diameter. The endothelial membrane contains between 500,000 to 600,000 cells. The normal endothelium has between 2,500 - 4,000 cells/sq. mm in the young healthy eye and declines to approximately 1000 to 2000 per square millimeter in the elderly.[21,31] The average cell density for an individual of age 23 is approximately 3,060.[32-34] Capella suggests that between the ages of 15 and 50 the endothelial cell density remains fairly constant, and that pleomorphism occurs at about the age of 60 to 65.[35] Laing et al maintains that the

pleomorphism, due to aging, occurs gradually and progressively.[36]

The endothelial pump has been demonstrated to be a bicarbonate pump which controls the normal hydration, thickness, and transparency of the cornea.[29,30] The exact function of the endothelial pump is not fully understood.

The majority of articles report no mitosis of the endothelial cell except possibly in the very young, although a recent article by Olsen and Davanger has shown otherwise in studies on human eyes in vitro.[37]

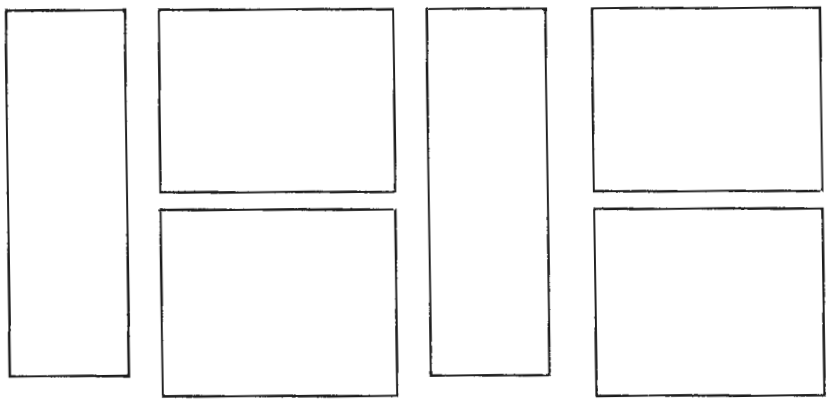
Considering the significance of the endothelial layer it is important to observe and photograph this layer of the cornea. The two systems enabling the observer to accomplish this observation are the slitlamp and the specular microscope. The first of these, the slitlamp, the method used in this study is the more common and less expensive method. The slitlamp utilizes specular reflection from the endothelial cell layer to accomplish the observation. In 1970, Brown developed a macrophotographic system for anterior ocular segment photography which gave magnification of 10X.[38] Zantos and Holden and McMonnies and Zantos in 1977 and 1979 used a similar system and a process of rephotography to achieve higher magnification for the study of endothelial changes resulting from contact lens wear.[39,40] The other method for endothelial observation is the specular microscope. In this study, where the endothelium was

monitored, the use of topical anesthetics and the direct corneal contact that are necessary with the specular microscope were contraindicated. The slitlamp endothelial photographic system has the advantage of being noncontact and noninvasive, and is capable of repeatable observation of specific areas.[41] Slit lamp photographs will provide approximately 0.08 mm^2 for study while the specular microscope provides approximately 0.035 mm^2.[31]

After obtaining photographs of the corneal endothelial layer, there are several methods of measurement and quantification. There have been four methods recorded for measurement of the endothelial mosaic.[42] The four are: A rectangle, planimeter, digitizer, and cell sizer. In the rectangle method, also called fixed frame analysis, the observer counts the number of cells in a rectangle and reports a cell density. The Planimeter is used to trace the outline of a singe cell or group of cells and measure their area directly. When using the Digitizer, a computer compiles the measurements. A digitizer records the X-Y coordinates of cell apices directly when the photograph is placed on an electronic grid and apices of the cell outline are touched with a pen. The fourth method is the cell sizer, which works by simply comparing the endothelial photograph with a picture of cells of known size. The results from the rectangle, planimeter, and digitizer agree within 10% of one another.[42]

When using slitlamp photography, the most common measurement technique is to project slides of the endothelium onto a counting grid as shown in figure 3.

Figure 3. Counting grid utilized in determination of endothelial cell density.



The cells in six rectangles of equal area are counted and averaged. Each rectangle is approximately the size of the area that would be photographed by a specular microscope. Cells that touch the superior and left edge of the rectangle are counted and those touching the inferior and right side are not counted. A measurement scale photographed at the same magnification as the endothelial cells is projected onto the counting grid to determine the area being photographed. The average number of cells per rectangle is then multiplied by the magnification factor as determined with the measurement scale slide. The result is the cell density

(cells/ sq. mm.).[34] The instrument used in this study was the "Nikon Non-Contact Endothelial Camera".[43]

It has been demonstrated that the endothelium undergoes pleomorphism with age.[36] The mean endothelial cell area is known to increase with increasing age. The mean area of the cells is approximately twice as large in people in their 80's as found in individuals in their 20's.[36] An enlargement of cells is found also in corneas suffering injury or those that have undergone surgery, i.e. cataract extraction.[29] Several investigators have documented transient changes in the endothelium due to contact lens wear.[39,41,44-46] In the majority of new contact lens patients the appearance of endothelial blebs is noted within ten minutes and seems to peak at approximately 30 minutes and then to gradually reduce to normal. The blebs also rapidly disappear upon removal of the lenses. Investigators have further stated that a decrease in number of endothelial cells occurs with the wearing of hard contact lenses. Schoessler and Woloschak state there is a decrease in typical hexagonal cells and increased polymegathism.[47] A study, by Caldwell et al reported that prolonged hard contact lens wear lowers the endothelial cell count.[48] Stocker and Schoessler found that prolonged wear of PMMA contact lenses caused polymegathism (a large variation in cell size) but could not confirm the cell loss reported by Caldwell et al.[48,49]

The purview of this portion of the research was to

monitor the endothelial layer in extended wear contact lens patients and to measure changes in the endothelial cells over a five month period. Both male and female patients were examined to provide a fair representation of the United States Military Forces as well as the population in general. A number of researchers have attempted to correlate ocular changes and the female menstrual cycle.[50-52] El Hage and Beaulne found in their study on this subject, that there was no apparent change in corneal thickness during the cycle.[51]

This research makes a comparison of three types of contact lenses that are manufactured from three different materials and have different water contents. Patients were fit with a different lens on the right and left eye. In recent research in this area, when corneal thickness, corneal oxygen consumption, and the endothelial bleb response were monitored, no significant contralateral effect was observed.[53]

STATEMENT OF THE PROBLEM

The problem addressed in this study is that of the "acceptable changes" found in the endothelial layer of the cornea and that of corneal thickness during wear of extended wear contact lenses. The first hypothesis which this study will address, assumes changes in corneal thickness will be proportional to the differences in contact lens water content (of various manufacturers) with the use of extended wear contact lenses. The second hypothesis assumes that with differences in water content and therefore oxygen transmissibility there will be morphological changes of the endothelial layer.

The sample used was a group of thirty-nine subjects (seventy-eight eyes) composed of twenty-five females and fourteen males. Age of the subjects ranged between 18 and 35 years of age to parallel the primary military age. The study dealt with spherical lens fittings only of refractive errors between -1.00D to -8.00D. The following conditions were considered absolute contraindications for extended wear contact lenses: Anterior segment infections, blepharitis, dry eye (tear break up time of less than 10 seconds), poor personal hygiene, history of past ocular surgery, trauma or pathology, pregnancy.

METHODOLOGY

The investigative procedures of this study were conducted at the clinic facilities of the Pacific University, College Of Optometry.

Following a comprehensive visual examination, patients meeting the predetermined criteria were selected for participation in the study. The patients were selected from Pacific University, Forest Grove and surrounding communities.

The criteria established for patient selection included the following:

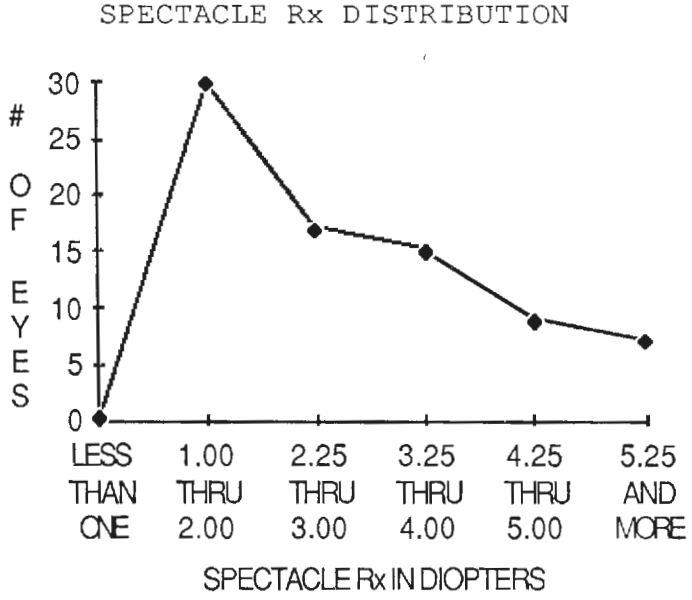
1. Age - between 18 and 35 years of age (to parallel the primary military age).
2. Refractive Error - Between -1.00 Diopter to -8.00 Diopters (again to stay within military requirements).
3. Tear Break Up Time (TBUT) - Greater than 10 seconds.
4. Subjects may not exhibit any of the following:
   a. Anterior segment infections.
   b. Blepharitis.
   c. Poor personal hygiene.
   d. History of past ocular surgery, trauma or pathology.
   c. Pregnancy.

Approximately 100 individuals were screened for participation in this study. Twenty-five (25) females and fourteen (14) males were selected for the study. Patients who hadpreviously worn soft contact lenses were accepted for the study. Abstension from wearing their prior contact lenses for a minimum of fourteen days was required before fitting procedures began. Refraction and Keratometer readings were monitored to insure corneal stability prior to fitting

on those who had been wearing lenses immediately prior to the study. Eleven of the patients selected had worn soft contact lenses at some time prior to the study with only six patients wearing contact lenses at the time of selection for the program.

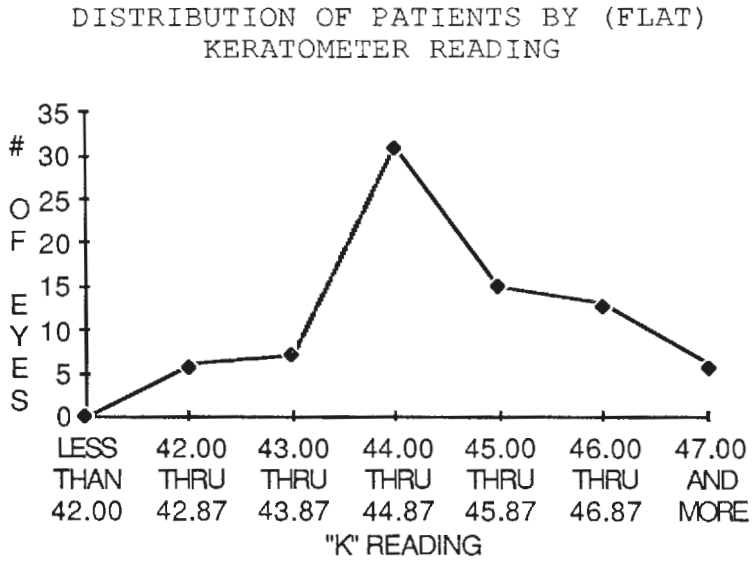
The following graph illustrates the distribution of spectacle correction of the patients involved in this study. Seventy-eight eyes are represented.

Graph 1. Distribution of spectacle correction of the patients in the extended wear study.



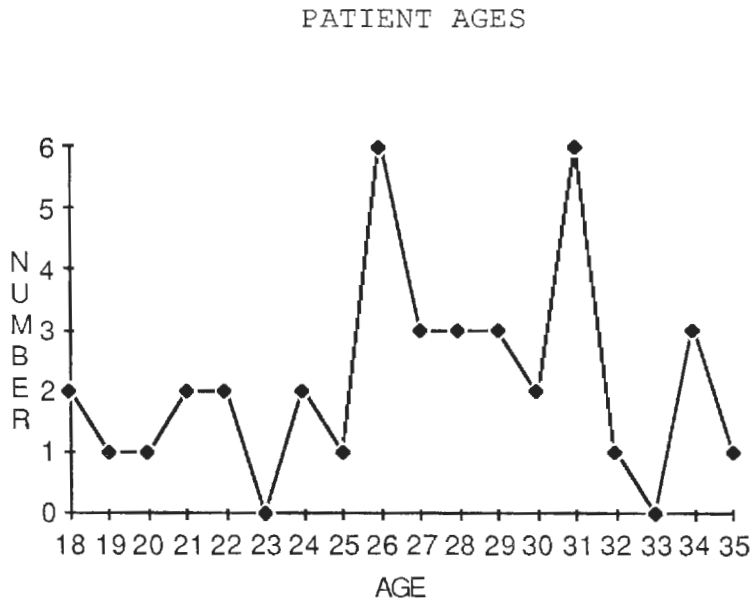
The following graph illustrates the distribution of patients by their flattest keratometer readings. Seventy-eight eyes are represented.

Graph 2. Distribution of Keratometer (Flat) Readings of the patients who participated in the extended wear study.



The following graph illustrates the ages of the patients selected for this study, thirty-nine (39) in number. The mean age was 27.1 within a range of 18 to 35 years.

Graph 3. Ages of the patients who participated in the extended wear study.



The research made a comparison of three types of lenses of different water content. They were the Permaflex (74%) by CooperVision, the Hydrocurve II (55%) by Barnes Hind and the CSI-T (38.5%) by Syntex.

Permaflex™ hydrophilic contact lenses are manufactured by CooperVision Optics, Ltd. using the material Surfilcon A. Permaflex™ has a diameter of 13.5 to 15.0mm. The center thickness for minus lenses ranges from 0.08 to 0.22mm. It is available in 8.70 and 8.90 base curves and from -0.25D to -10.00D in minus power. The lens material, surfilcon A, is a copolymer of methyl methacrylate, vinyl pyrrolidone, and other methacrylates. CooperVision specifies the physical

properties of the Permaflex™ contact lens as follows:

a. Refractive Index - 1.385 at 25°C
b. Light Transmittance - >96 percent
c. Water Content - 74 percent
d. Oxygen Permeability - 34.0 X 10^{-11} (cm^2/sec)(ml O^2/ml x mm Hg) at 25°C

Hydrocurve II® hydrophilic contact lenses are manufactured by Barnes-Hind, Inc. using the material Bufilcon A. Hydrocurve II® has a diameter of 14.0 to 16.0mm. The center thickness for low minus lenses is 0.05mm. It is available in 8.50, 8.80 and 9.10 base curves and from -0.25D to -12.00D in minus power. The lens material, bufilcon A, is a hydrophilic random copolymer of 2-hydroxyethyl methacrylate, N-(1,1-dimethyl-3-oxobutyl)-acrylamide, and methacrylic acid. Barnes-Hind indicates that the physical properties of the Hydrocurve II® contact lens are as follows:

a. Refractive Index - 1.41
b. Light Transmittance - 90 percent
c. Water Content - 55 percent
d. Oxygen transmissibility - Dk/L 22.7 X 10^{-9}

CSI®T hydrophilic contact lenses are manufactured by Syntex Ophthalmics, Inc. using the material Crofilcon A. CSI®T has a diameter of 13.0 to 15.0mm. The center thickness for minus lenses ranges from 0.02 to 0.40mm. It is available in 8.30, 8.60, 8.90 and 9.35 base curves and from plano to -7.00D in minus power. The lens material, crofilcon A, is a 61.5% 2,3-dihydroxypropyl methacrylate and methyl methacrylate cross-linked with ethylene glycol dimethacrylate. Syntex Ophthalmics, Inc. specifies the

physical properties of the CSI®T contact lens as follows:

a. Refractive Index - 1.44
b. Light Transmittance - >95 percent
c. Water Content - 38.5 percent
d. Oxygen Permeability - 12.0 X 10^{-11}

Patients were supplied with a different water content contact lens on each eye. The study was single blind since the patients were not told that they were wearing two different brands of lenses. All patients, with one exception, were fit with the Hydrocurve II (55%) on one eye and either the Permaflex (74%) or the CSI-T (38.5%) on the other eye. The one exception, due to fitting difficulty, was fit with a Permaflex on one eye and the CSI-T on the other. This subject was unable to adapt to extended wear and was dropped from the study during the first week and that subject's data is not included in the results.

The following table shows the distribution of contact lenses by brand, base curve-diameter and number of eyes wearing that lens.

Table 1. Distribution of contact lenses by brand, base curve-diameter and number of eyes wearing the lens.

Brand	Base Curve-Diameter	Number Of Eyes
Permaflex™	8.70 - 14.4	20
Permaflex™	8.90 - 14.4	1
Hydrocurve II®	8.50 - 14.0	3
Hydrocurve II®	8.80 - 14.5	29
Hydrocurve II®	9.10 - 14.5	6
CSI®T	8.60 - 13.8	11
CSI®T	8.60 - 14.8	3
CSI®T	8.90 - 14.8	4
CSI®T	9.35 - 14.8	1

An extensive trial lens set was made available by the three companies so that optimal fittings could be accomplished. At least two researchers, usually three, were present at each fitting to insure the subjects received the best fitting lenses. At the time of dispensing, each subject was instructed in insertion, removal and care by the same researcher to insure that each received the same instructions. Each patient also received written instructions on insertion, removal and care which are attached as appendix A. All subjects signed the Informed Consent Form required by the Institutional Review Board. A copy of the Informed Consent Form is attached as appendix B.

All patients were given the same wearing schedule as follows:

> Day One - Six (6) hours of wear and removed overnight.
> Day Two - Ten (10) hours of wear and removed overnight.
> Day Three - Worn all waking hours and removed overnight.
> Day Four - Extended wear.

After initial adaptation, subjects were instructed to wear lenses for a period of one week and then to remove overnight for cleaning. They were further instructed that contact lens removal at any time for cleaning with Pliagel® was permitted if the contact lenses were returned to the eye. The American Optical Septicon system was provided to all patients for their weekly cleaning regimen. The Blairex System II, consisting of the Blairex Deionizer and salt

tablets was provided to each subject to prepare their normal saline. Patients were told that they could use a drop of Clerz® 2 for lubrication as needed.

The patients reported to the clinic for follow-up examinations according to the following schedule: Day 1 of extended wear, day 4, day 7, day 14, day 21, day 28, day 60, day 90, day 120 and day 150.

During each visit the following were completed as part of the examination:

a. History/Discussion.
b. Visual acuity with a Clason Projector.
c. Contrast Sensitivity Function with contact lenses.
d. Automatic refraction with the Humphrey's Automatic Refractor with contact lenses.
e. Keratometry with the Humphrey's Auto Keratometer with contact lenses.
f. Slit Lamp examination.
g. Lens permeability and thickness measurement.
h. Contrast Sensitivity Function without contact lenses.
i. Endothelial photography.
j. Pachometry.
k. Automatic refraction with the Humphrey's Automatic Refractor without contact lenses.
l. Keratometry with the Humphrey's Auto Keratometer without contact lenses.
m. Keratometry with the Bausch & Lomb Keratometer.
n. Corneascope photography of both corneas.
o. Intra Ocular Pressure with the American Optical Non-Contact Tonometer.

The initial fitting of contact lenses was recorded on the "Contact Lens Fitting Form" (SAM FORM 1) and each follow-up examination was recorded on the "Contact Lens Followup Form" (SAM FORM 2). A performance depth perception test was taken prior to starting the study and at the conclusion of the study. The Keystone diagnostic series (aviators unit) was

used as a visual performance determination. Baseline testing (pre-contact lens wear) was done with best spectacle correction prior to start of contact lens wear. Final testing (post-contact lens wear) was preformed (a) while wearing contact lenses and (b) with best spectacle correction at the conclusion of the study. The results of this testing was recorded on "Performance Depth Perception Test" (SAM FORM 3).

Meticulous records of the endothelial photographs were maintained in the Photograph Log Book on the "Photo Record" (SAM FORM 4).

Four control patients were utilized during the course of this research. Two female and two male patients were selected that met the general criteria utilized for subjects. These control patients had not previously worn contact lenses and agreed not to wear contact lenses during the duration of the study. The results of the testing accomplished on these patients was recorded on the "Control Patient Form" (SAM FORM 5).

All patients were fit with a single brand of contact lens at the conclusion of the research period. A questionnaire was completed by each contact lens wearer at the completion of the 150 day examination. "Extended Wear Contact Lens Patient Questionnaire" (SAM FORM 7) was utilized for this purpose. One of the questions asked the patients was: "Do you have a preference between your right and left lenses during the study with:

(a) Vision - Right___ Left___ No Difference___

(b) Comfort - Right___ Left___ No Difference___

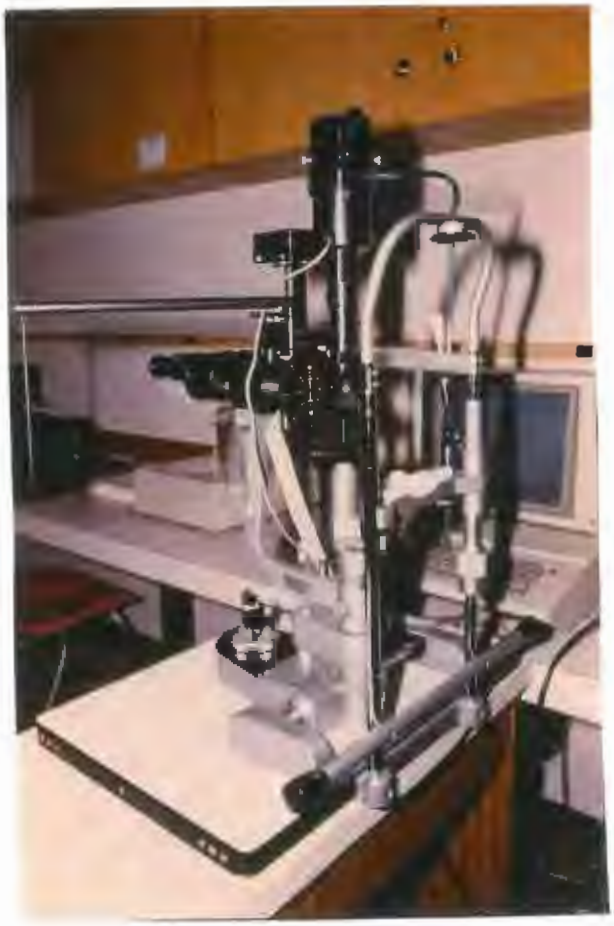
(c) Ease of Handling - Right ___ Left___ No Difference___"?

This and other information was utilized during the post-study refitting procedure. The researchers' judgement was always of paramount importance during this procedure, but in cases of equally fitting research lenses, the patients' preference would be considered.

The promise of a new pair of contact lenses upon completion of the program as well as the exceptional followup care was used as an incentive during the study. Upon dispensing of the new pair of contacts the patients were asked to read and sign a statement enforcing the need for routine care and follow-up examinations. A copy of this form (SAM FORM 8) and their contact lens specifications (SAM FORM 6) were given to the patients. A copy of these eight "SAM" forms are included as appendix C.

The two instruments of primary importance to this research were the Pachometer and the Endothelial Camera. The purpose of the Pachometer is to provide the mechanical to electronic digital conversion, data analysis, operator interaction and the output functions necessary in order to accurately measure apparent corneal thickness. The total measurement system consists of a slitlamp, a fixation device, an optical doubling device (with eyepiece), a potentiometer, and an Apple IIe computer.

Figure 4. Photograph of Pachometer



The fixation device allows fixation of the patient to be changed at the discretion of the operator in eight (8) meridians and seventeen (17) locations. The fixation device contains nineteen (19) L.E.D.s (Light Emitting Diodes). There are seventeen (17) red L.E.D.s arranged in eight (8) meridians and two (2) yellow L.E.D.s that allow for alignment in the vertical plane to insure that readings are taken

perpendicular to the cornea. Any one of the 17 red L.E.D.s may be illuminated at random from the Apple IIe keyboard. The two yellow L.E.D.s remain illuminated at all times to insure proper alignment.

The potentiometer assembly attaches to the slitlamp by slipping it on the mounting post used for a Goldman Applanation Tonometer. The potentiometer is slid over the large pin and is locked into place with the small short pin. The potentiometer is a device for measuring electromotive force or potential difference by comparison with a known voltage.

The bi-prism eyepiece is inserted into the right ocular of the slitlamp with the eyepiece slit in a horizontal orientation. This allows for vernier alignment of the upper and lower slits.

The Apple IIe computer along with the "Contact Lens Research Software" performs all of the analysis and hardware control functions. A copy of the "Contact Lens Research Software" program is attached as appendix D. The computer receives all of the input from the potentiometer, performs the analysis, controls the fixation lights, and provides an interface to the Apple Imagewriter Printer. The computer program computes the mean, standard deviation, and range of the current set of thickness samples. These items are recomputed after each measurement or after deleting a measurement. The computer and program also calibrates each measurement to compensate for operator biases in the

measurement process. All pachometer readings were accomplished by this researcher in order to control the endpoint criterion, touch versus overlap, as much as possible. The ambient room illumination was the same at each reading and the slit beam adjustment knob was glued in place in order to maintain the same width throughout the study.

Pachometry was accomplished at five locations on both corneas at each of the eleven visits. Central, superior, inferior, nasal and temporal reading were performed. The superior, inferior, nasal and temporal readings were taken at points 3.55mm from the center of the cornea. The central reading is represented by the point "Q" in the patients data files (see Appendix F). Point "I" is the superior position, and point "M" represents the inferior position. Point "K" is the nasal reading on the right eye and the temporal reading for the left eye. Point "O" is the temporal reading on the right eye and the nasal reading for the left eye. The "Pachometer Instruction Manual" compiled by this researcher is included in appendix E.

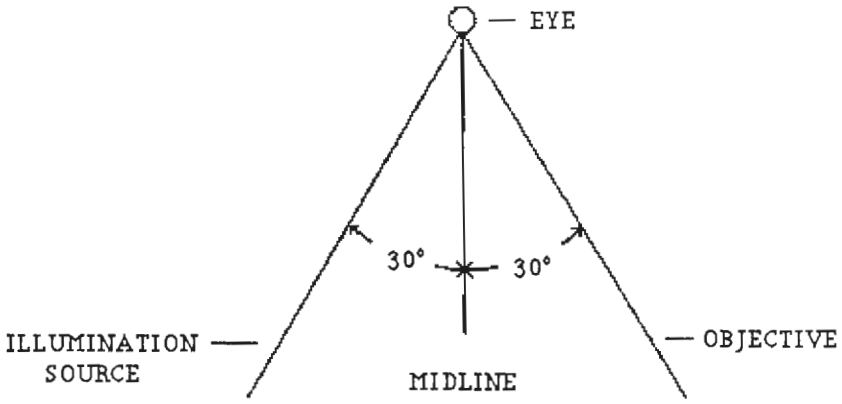
The other instrument of primary importance to this research was the endothelial camera. The Nikon Non-Contact Endothelial Camera was utilized through out the research period. The camera body used was the Nikon F3 with the MD4 motor drive. The Nikon DW-4 6X viewfinder was utilized for the critical high magnification photography. The objective lens used for all photography was the Nikon 5X in conjunction with a Nikon TC-201 2x Teleconverter. The F-number of the

objective lens was 2.6 for all exposures. Total observation magnification of the system was approximately 60X. Ektochrome 100 ASA slide film was used for all photographs. The unit is powered by the Nikon model T1 power supply. The illuminating light (observation light) was maintained at the medium setting. The flash (strobe output) was maintained at the high or number 5 position.

Figure 5. Photograph of Endothelial Camera

An angle of 60° was maintained between the objective arm and the illumination source arm, being approximately equally split on either side of the midline. Figure 6 illustrates the arrangement of the camera system.

Figure 6. Illustration of the Objective and Illumination Source arrangement of the Endothelial Camera

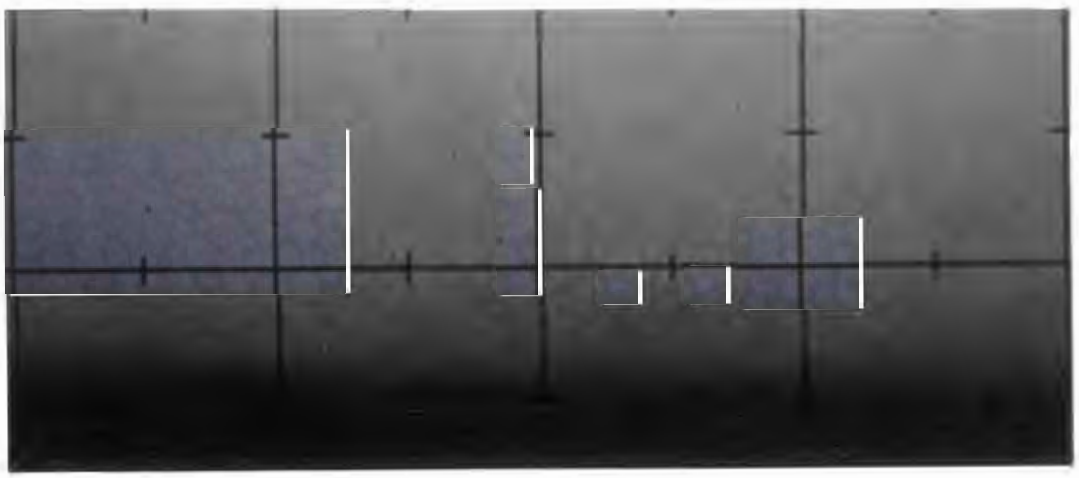


In order to obtain photographs of the same area of the cornea, a system was devised based upon one reported by Barr and Schoessler.[41] A sighting telescope and the camera assembly base were mounted in fixed positions on the instrument stand. The patient was positioned in the same manner at each examination so that the crosshairs of the telescope coincided with the pupil of the left eye while observing a fixed fixation target. Utilizing a protractor that was attached to the head rest of the instrument, the fixation target was set in the same position at each setting

as recorded for that particular subject.

All photographs were taken by this researcher to eliminate as much operator variability as possible. A minimum of three exposures were taken of each eye on every visit. The slides were reviewed after development to ascertain the highest quality photograph from that series. The slides were then printed at the largest possible enlargement on photographic paper of 2 1/2 inch by 10 inch strips. The resulting print gave an overall magnification factor of 400X. This was determined by photographing a high resolution photographically reduced scale from a measuring reticle marked in tenths of a millimeter. Figure 7 is an example of the photographs employed during this study.

Figure 7. Photograph of Endothelial Cells.



In order to determine the cell density from the photograph, a template was used to inscribe two rectangles and two squares of equal area on the print. The cells were counted in each of the four areas and then averaged. Partial cells were counted that touched the left and top edges and not counted if they touched the bottom and right edges. The cell average was then multiplied by a factor to give the number of cells per square millimeter.

TREATMENT OF DATA

This section will be divided into two seperate divisions, one dealing with the data collected from pachometry and the other dealing with the endothelium photography data.

PACHOMETRY

Microsoft File, a database manager used with the Macintosh™ Computer, was used to store all of the thickness measurements that were collected during the course of the research. The completed pachometry subject data files are contained in Appendix F. This information was then transferred into Microsoft Excel, which is a fully integrated program consisting of a spreadsheet, database and charting package. A spreadsheet showing all patient data regarding pachometry is located in Appendix G. This spreadsheet also shows the percentage change for each thickness measurement from day one to day 150. The Excel program was used to manipulate the data so that it could be loaded directly into a StatView™ statistical program.

There were eleven visits for each of the patients and therefore eleven varibles within each group of patients. The analysis of variance and the corresponding test of significance based upon the "F" distribution allows testing differences among all of the means at the same time. Edwards describes the test as follows: "The analysis of variance, as the name indicates, deals with variances rather than with standard deviations and standard errors.[54] The rationale of

the analysis of variance is that the total sum of squares of a set of measurements composed of several groups can be analyzed or broken down into specific parts, each part identifiable with a given source of variation. In the simplest case, the total sum of squares is analyzed into two parts: a sum of squares based upon variation within the several groups, and a sum of squares based upon the variation between the group means. Then, from these two sums of squares, independent estimates of the population variance are computed".

Analysis of Variance by lens type and by position of measurement (central, superior,etc.) are located in Appendix H. There were twelve (12) eyes represented in the Permaflex™ group, fourteen (14) in the Syntex CSI®T group, and twenty-six (26) in the Hydrocurve II® group. Also included is the study of the control group of eight (8) eyes.

All of the Analysis of Variance tests proved statistically insignificant. Results of the one way analysis of variance and the corresponding test of significance based on the "F" distribution demonstrated all five points tested to be below 1.174 with $p > .25$. The mean for the central measurement was .525 with a standard deviation of .039. There was a range of .152 with the maximum being .613 and the minimum being .461. This, therefore, supports the statistical null hypothesis and disproves the working hypothesis.

Located in Appendix I are statistical data that were formulated from the five different points measured during this study. These pages show the various statistical data on 52 eyes that finished the study. The data represents the findings that were taken prior to dispensing of contact lenses.

ENDOTHELIUM

Counting of the endothelial cells was accomplished as described in the Methodology Section. Results of the counting at day zero and day 150 were recorded on an Excel Worksheet along with the results of the polymegathism grading. The Polymegathism Grading System was utilized as described in the February 1986, Contactology.[55] A copy of this worksheet for the 52 subjects as well as the control patients is located in Appendix J. These data were transferred from Excel into the Stat View Statistical Program for analysis. No statistical significance was found between beginning and final cell count. Results of the one way analysis of variance and the corresponding test of significance based on the "F" distribution was .079 with $p > .25$. The mean was 2900 cells/mm^2 with a standard deviation of 244.147. There was a range of 900 with a maximum of 3300 cells/mm^2 and a minimum of 2400 cells/mm^2. The statistical data are located in Appendix J.

RESULTS

This section on results will be separated into three different sections subtitled: General Comments, Pachometry and Endothelium.

GENERAL COMMENTS

Twenty-six (26) of the thirty-nine (39) patients who started the program completed the full 150 days of the study. The following table describes what happened to the thirteen patients who did not complete the study.

Table 2. Disposition of 13 patients not completing the full 150 days of the extended wear contact lens study.

Patient Number	Visit Completed	Reason
101	28	Joined Army
104	120	EKC like symptoms interrupted wear
106	60	EKC like symptoms interrupted wear
110	90	Moved from area
114	28	Pregnancy
116	00	Inability to adapt to extended wear
117	90	EKC like symptoms interrupted wear
124	60	EKC like symptoms interrupted wear
125	60	EKC like symptoms interrupted wear
127	00	Pregnancy
128	00	Unable to meet study requirements
131	07	Inability to adapt to extended wear
138	60	EKC like symptoms interrupted wear

The six patients with Epidemic Keratoconjunctivitis (EKC) like symptoms were able to continue wearing contact lenses after a wearing break. These six cases were not typical EKC, but did have several similar symptoms. Mild epithelial punctate keratitis with small corneal infiltrations were

present in most cases. Preauricular adenopathy was present only in a few of the cases. Symptoms such as photophobia, lacrimation, discharge, or swelling were rarely described by any of the patients effected. Symptoms affected five female and one male patient. The six cases involved five eyes that were wearing Permaflex™ and one that was wearing CSI®T. All cases cleared in approximately three to four weeks.

Thirty-four (43.5%) of the seventy-eight contact lenses that were originally ordered for the patients completed the entire study (150 days). The following table gives the breakdown on the twenty-eight lenses that had to be replaced during the study.

Table 3. Reasons that contact lenses were replaced during the extended wear study.

Number replaced	Explanation
5	Lost lens
2	Fitting Change
2	Power Change
8	Crack or Split in Lens
8	Torn Lens
2	Chip in Edge
1	Growth on Lens

All three lens types gave similar results as to replacement and to percentage finishing the program. At the termination of the research program, thirty-five patients were refit with new contact lenses: eighteen received

Hydrocure II®, eleven received Permaflex™ and six received Syntex CSI®T.

The following table shows the response to question six from the patient questionnaire that was taken at the termination of the program.

Table 4. Patient response to questionnaire comparing Hydrocurve II (HC), Permaflex (PF), and CSI-T (CS) contact lenses in three categories: Vision, Comfort and Handling. Numbers indicated show preferred lens. ND indicates patient could not determine a difference in the lenses.

	VISION	COMFORT	HANDLING
GROUP 1	HC - 2	HC - 3	HC - 4
Hydrocurve &	PF - 4	PF - 6	PF - 2
Permaflex	ND - 13	ND - 10	ND - 13
GROUP 2	HC - 2	HC - 1	HC - 6
Hydrocurve &	CS - 5	CS - 4	CS - 2
Syntex CSI-T	ND - 7	ND - 9	ND - 6

Non-Contact Tonometry was completed on each visit. Table 5 is a compilation of the results of the tonometry readings. Previous research has shown that the Non-Contact Tonometer has a ±3mm Hg range at the 95% accuracy level.[56,57] No significant clinical difference was noted on any of the patients during the course of the study. Each entry on table 5 represents the measurements that were taken on the various visits.

Table 5. Results of Non-Contact Tonometer. The right eye measurement is recorded first followed by a slash (/) and the left eye measurement. The triple X (XXX) notation indicates that no measurement was accomplished on that occasion.

PT. #	DAY 0	DAY 1	DAY 4	DAY 7	14	21	28	60	90	120	150
101	17/17	14/13	16/12	16/13	18/18	17/15	15/14	XXX	XXX	XXX	XXX
102	11/14	11/11	09/15	10/10	12/11	09/10	11/15	10/13	11/10	11/08	09/09
103	09/10	11/11	XXX	12/11	10/09	10/11	10/08	12/10	14/12	15/12	11/11
104	14/15	12/10	15/14	15/16	14/12	12/14	11/09	10/10	13/11	16/12	XXX
105	09/13	07/09	07/10	09/09	07/09	08/09	10/11	08/11	07/09	10/12	08/10
106	16/14	12/13	18/14	14/12	11/12	14/14	15/11	10/13	XXX	XXX	XXX
107	20/20	16/16	19/18	19/20	18/20	20/20	16/19	16/17	19/20	06/18	19/19
108	12/13	11/11	11/10	10/10	11/12	11/13	14/13	11/14	13/10	10/08	11/09
109	11/15	12/14	12/15	13/14	11/14	12/16	13/15	10/12	14/16	12/12	12/13
110	12/13	13/12	15/15	16/15	13/11	13/13	15/12	12/12	16/16	XXX	XXX
111	14/13	09/09	09/10	11/09	12/13	09/11	10/11	08/09	11/12	10/09	10/08
112	14/14	17/15	15/15	14/17	12/14	17/19	17/19	14/15	12/15	12/14	12/15
113	09/09	10/10	11/11	14/11	11/09	12/11	11/11	10/10	10/10	13/11	11/11
114	15/17	15/14	11/12	14/15	13/13	11/13	13/11	XXX	XXX	XXX	XXX
115	10/13	10/12	09/11	08/10	10/12	10/12	09/12	11/12	08/10	08/11	11/12
116	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
117	11/12	13/13	13/10	09/09	14/10	12/11	13/09	12/09	14/10	XXX	XXX
118	13/11	09/11	11/08	11/13	13/15	11/15	12/12	14/12	13/13	13/14	11/10
119	14/15	15/11	13/12	14/13	12/12	17/13	13/15	13/13	16/16	13/13	13/12
120	11/12	12/13	12/12	14/14	13/14	15/14	15/13	15/12	12/12	12/11	17/15
121	12/09	13/10	11/14	12/12	09/08	13/10	11/10	10/11	09/10	12/09	09/10
122	17/16	14/15	13/13	14/15	16/19	11/14	12/15	15/16	14/16	15/13	18/16
123	09/11	11/11	11/10	12/11	14/13	09/11	13/12	12/08	12/13	12/09	09/08
124	20/20	22/20	18/17	18/20	17/18	19/13	17/16	20/18	XXX	XXX	XXX
125	18/19	15/12	14/13	10/14	15/19	14/12	12/12	09/11	XXX	XXX	XXX
126	12/12	12/11	11/11	12/13	11/11	11/11	13/13	11/11	12/12	12/09	13/13
127	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
128	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
129	14/13	12/10	12/15	10/13	13/12	10/09	11/11	09/10	11/09	12/14	11/12
130	09/09	08/11	11/09	09/08	08/10	09/10	08/10	08/11	10/11	08/08	06/09
131	17/16	14/15	16/15	16/17	XXX	XXX	XXX	XXX	XXX	XXX	XXX
132	14/15	15/15	16/13	14/15	15/13	15/12	14/12	14/13	12/16	12/12	15/13
133	10/12	11/10	09/11	08/10	08/08	09/09	08/10	08/09	11/08	09/09	10/10
134	19/15	14/13	16/12	16/13	12/12	13/11	14/12	14/13	17/13	15/14	15/12
135	11/09	11/10	11/10	12/11	11/09	11/10	12/12	09/11	10/11	11/10	09/09
136	13/12	09/10	12/12	13/13	11/13	12/15	14/14	14/12	10/12	15/12	12/13
137	11/09	09/10	10/09	11/12	09/08	11/11	12/08	11/08	10/07	09/10	09/09
138	15/15	12/14	11/14	11/12	12/12	11/10	14/17	13/14	XXX	XXX	XXX
139	10/13	10/12	13/12	12/12	10/11	10/09	10/11	10/10	11/12	10/12	11/09

Results of the visual performance test, Keystone Aviators Unit, is shown in Table 6.

Table 6. Results of the Keystone Diagnostic Series Aviators Unit. Test was administered prior to and after contact lens wear. Results shown are for best spectacle Rx and best contact lens Rx at the end of the research period.

	IMPROVED	REDUCED	NO CHANGE
BEST SPECTACLE Rx	21	3	9
Best Contact Lens	15	5	13

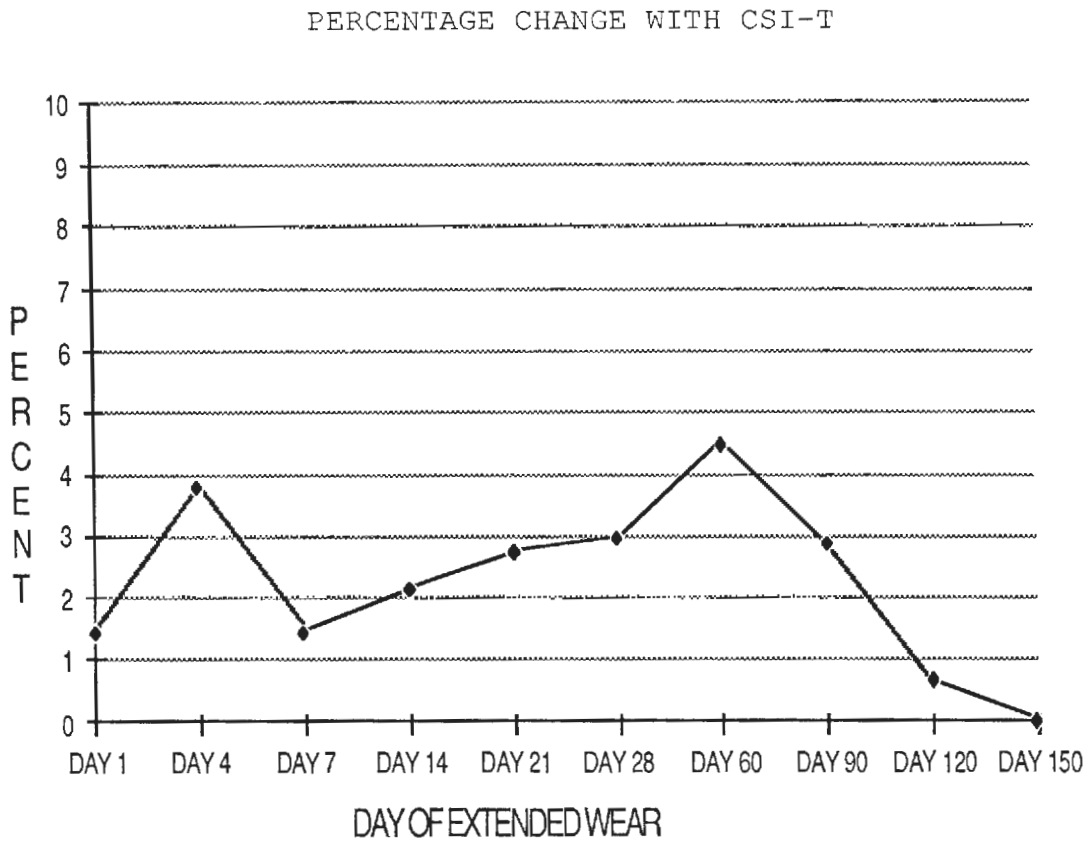
The full results are located in chart form in Appendix K.

PACHOMETRY

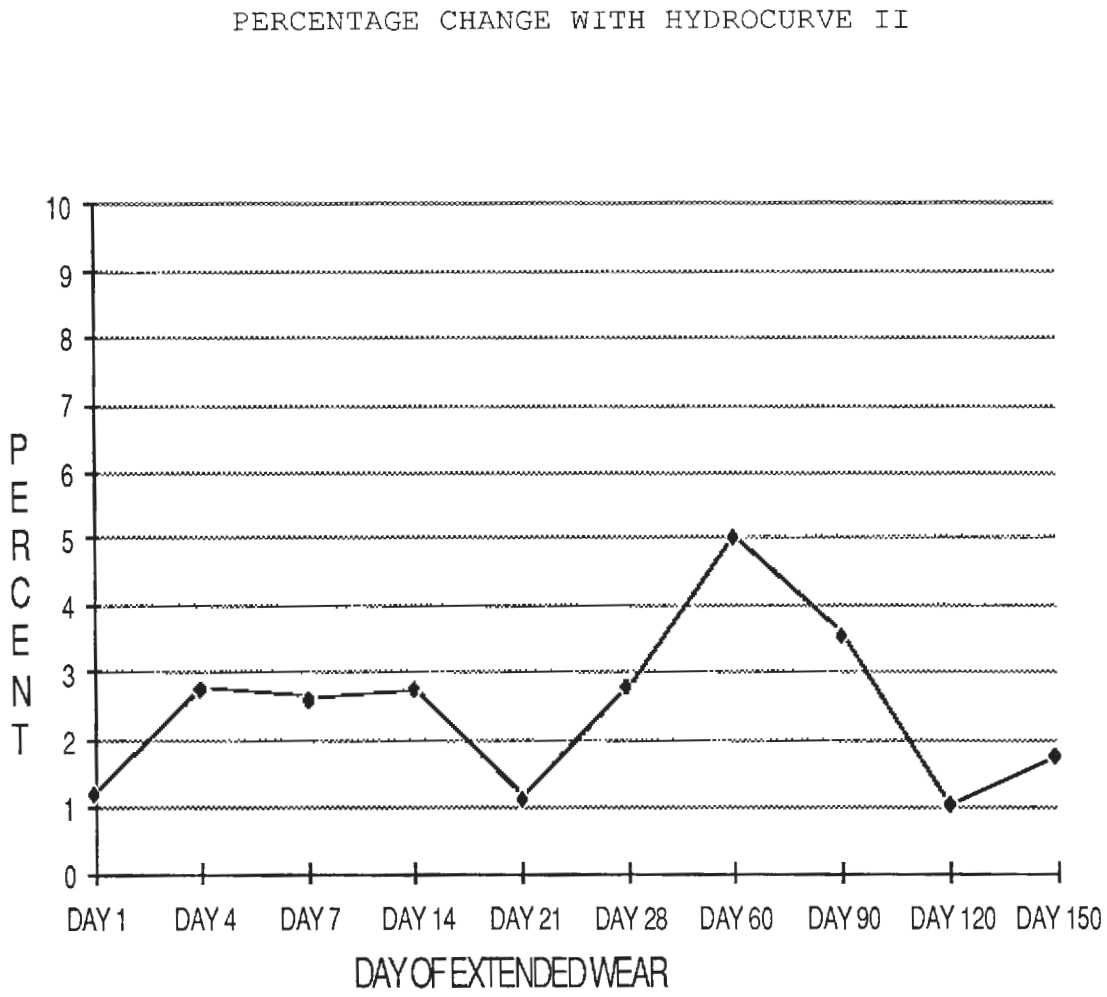
Relative to the first hypothesis, data analysis performed with the analysis of variance and the corresponding test of significance are located in Appendix H. The statistical analysis of corneal thickness change, at all five locations, measured over a period of 150 days was found to be insignificant. The following graphs (4,5,6,7) illustrate the percentage of change that the central corneal thickness experienced with the three types of contact lenses.

Analysis performed on the five locations measured on the control patients also proved to be insignificant with the maximum "F" test being .683 with $p > .25$.

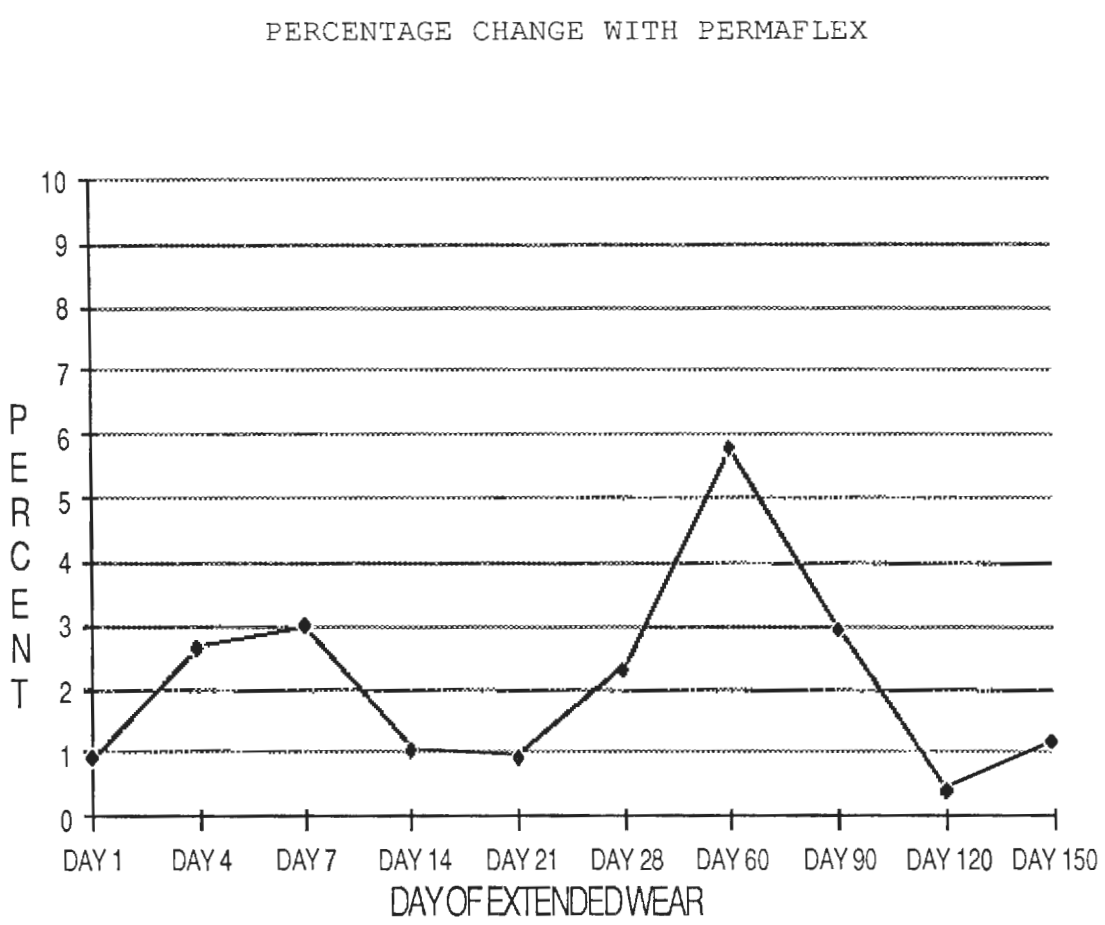
Graph 4. Percentage of central corneal thickness change with Syntex CSI-T Contact Lenses over a period of 150 days.



Graph 5. Percentage of central corneal thickness change with Hydrocurve II Contact Lenses over a period of 150 days.

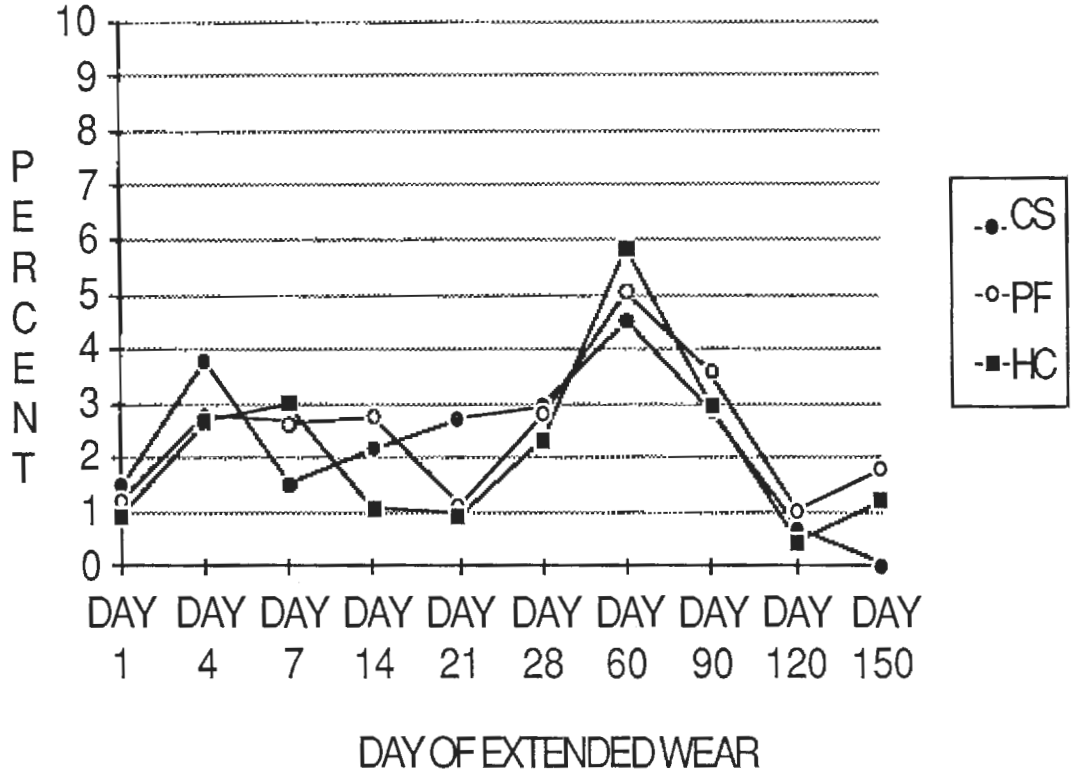


Graph 6. Percentage of central corneal thickness change with Permaflex Contact Lenses over a period of 150 days.



Graph 7 illustrates simultaneously the percentage of change that the central corneal thickness experienced with the three types of contact lenses. The thickness increase experienced at day sixty by all three lens types cannot be explained by the contextual contents of this research design.

Graph 7. Percentage of central corneal thickness change with Hydrocurve II (HC), Permaflex (PF), and Snytex CSI-T (CS) contact lenses over a period of 150 days.



ENDOTHELIUM

Relative to the second hypothesis, data analysis performed with the analysis of variance and the corresponding test of significance are located in Appendix J. The statistical analysis of the change in endothelial cell count between day zero and day 150 was not significant (.079 with $p > .25$). The mean number of cells found was 2900/mm^2. While there was not a significant change noted in cell density, there was an increase in polymegathism. 65.4% of the patients showed a small change in the amount of polymegathism demonstrated. No significant change in the amount of polymegathism could be found in the remaining 34.6% of the subjects. The following table shows the breakdown of the grading of the polymegathism, or lack of, in the patient population.

Table 7. Representation of the amount of polymegathism demonstrated by subjects in the extended wear research study. 52 eyes are represented.

NORMAL (NO POLYMEGATHISM)	6
GREATER THAN NORMAL - LESS THAN MODERATE	18
MODERATE	24
GREATER THAN MODERATE - LESS THAN SEVERE	4

No change was noted in either cell density or cell morphology among any of the control patients.

DISCUSSION AND CONCLUSION

The objective of this research project was to investigate the correlation between extended wear contact lenses and their effect on corneal thickness and the endothelial layer of the cornea.

The research questions were as follows: (1) Will changes in corneal thickness be proportional to the differences in contact lens water content during extended wear? (2) What effect will different (water content and oxygen transmissibility) contact lenses make on the morphological changes of the endothelial layer.

To examine these questions, measurements of corneal thickness at five locations on the cornea were taken before the wearing of contact lenses and on ten occasions, over a five month period, during extended wear. Endothelial photographs were also taken at all of the aforementioned occasions.

Based on the results of the analysis of variance and the corresponding test of significance, using the "F" distribution, the changes in corneal thickness throughout the study were not significant. None of the corneal thickness changes, at any of the five locations measured, proved to be statistically significant with any of the three different contact lenses.

The photographs of the corneal endothelium taken over the five month research period revealed no significant change in the endothelial cell density. 65.4 percent of the patients

demonstrated morphological changes of their endothelium. This was exhibited in the form of small increases in the amount of polymegathism.

The majority of the subjects did experience the transient appearance of endothelial blebs. One subject experienced significant temporary swelling of the cornea. These changes were easily observed with the slitlamp as folds in Descemet's Membrane prior to measurement by pachometry. This patient was dropped from the extended wear program, but continues to wear hydrophilic daily wear contact lenses in a successful manner.

None of the control patients exhibited either a change in cell density or cell morphology. Neither did any of the control patients exhibit a significant change in corneal thickness in any of the measured locations.

Only nine (23%) of the originial 39 subjects were released from the research program wearing their lenses in an extended wear mode. These patients were advised to remove their lenses for overnight cleaning twice a week (approximately every three to four days). They were also told of the importance of continued followup examinations.

The remaining subjects were advised to wear their lenses on a daily wear basis. Continual engorgement of the corneoscleral limbal plexus was the primary professional concern in advising these subjects against further extended wear. Clearly, one of the most significant findings of this study was the fact that only nine of the original 39 patients

were recommended for continued extended wear. This is exceedingly important from the standpoint that these patients were carefully selected from approximately 100 candidates for the program and that the compliance rendered by these patients was of an exceptional nature.

The conclusions are as follows:

(1) Corneal thickness was not significantly affected by the wearing of high, medium, or low water content contact lenses on an extended wear basis.

(2) Corneal endothelial cell density is not affected by the wearing of high, medium, or low water content contact lenses on an extended wear basis.

(3) Corneal endothelial morphological changes (increased polymegathism) does occur with wear of high, medium, and low water content contact lenses on an extended wear basis.

(4) Determination of successful wear of any extended wear contact lenses can only be done on an individual basis. Extensive followup examinations done on a timely basis, for the duration of the period that the patient wears extended wear contact lenses, is of utmost importance.

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APPENDIX A

CONTACT LENS INSTRUCTIONS

CARING FOR YOUR EXTENDED WEAR CONTACT LENSES

We want you to follow the steps listed below, always starting with the right lens first:

1. Set up all of the items you will need to clean and disinfect your extended wear lenses (Pliagel, extenzyme cleaner, Septicon disinfection system, and Blairex deionizer).
2. Wash your hands with a pure soap that does not contain additives. Rinse thoroughly.
3. Remove your lenses and clean them with Pliagel (see directions supplies with the package). This removes inorganic material from the lens surface.
4. Rinse your lenses off with non-thimerosal saline (Blairex system for making normal saline) to completely remove cleaner.
5. Place the lenses in the Septicon lens baskets and soak in the extenzyme cleaner for 15-20 minutes using the Lensept cup #1. This removes organic material (protein complex from your tears etc.) from the lens.
6. Replace the extenzyme cleaner with fresh saline and shake for 15 seconds.
7. Replace saline with Lensept solution and soak lenses for 10 minutes.
8. Fill Rinse cup #2 with saline solution. Remove the lens basket from cup #1 and place into cup #2. The lenses must be left in cup #2 for 6 hours to neutralize the Lensept disinfection solution.
9. After the 6 hour neutralizing cycle, remove the Septicon lens baskets from the Rinse cup #2. Replace the solution with fresh saline solution and allow the lenses to soak in it for another 3 minutes before placing the lenses back on the eyes.

FOLLOW-UP CARE FOR EXTENDED WEAR CONTACT LENS PATIENTS

Patients wearing contact lenses for extended periods of time require additional professional follow-up care to more closely monitor how their lenses are fitting. For this reason and for the purposes of this research project, the following schedule of follow-up evaluations will be followed:

*After 24 hours of extended wear,
*After 4 days of extended wear,
*After 1 week of extended wear and then weekly for three weeks,
*After each month of extended wear for the remainder of the 5 months of the study.

Your eyes should always "FEEL GOOD, LOOK GOOD AND SEE GOOD." If your eyes bother you at anytime, or if you have any questions or concerns, we want to be the first to know. You can always reach one of our research staff 24 hours a day, 7 days a week. Office 357-6151 ext. 2453, Dr. Tim Allen 357-3953, Dr. David Marrs 357-4026, Dr. Gary Slater 357-8378.

PACIFIC UNIVERSITY
COLLEGE OF OPTOMETRY CLINICS

59B

Extended Wear Lens Care and Handling

Proper care is necessary for successful wear, normal lens life, and good eye health. You will be provided with products to clean, disinfect and store your extended wear lenses. Use them as instructed.

Your lens cleaner is _____

Your lens disinfectant is _____

Your soaking solution is _____

Your rinsing solution is _____

Eyedrops to use before sleep and upon waking _____

NOTE: These products have been prescribed specifically for your lenses and eyes. Do not change or substitute brands unless you check with us first. Use of improper solutions may result in lens damage or eye irritation.

SPECIAL INSTRUCTIONS: _____

_____

_____

_____

Please note that although certain brands of lenses may be FDA approved for 7, 14, or even 30 days of wear, the adaptability of your eyes is the key factor in determining wearing time. Trust us to recommend a schedule suited to your individual needs. And remember, like any medical device contact lenses must be monitored on a regular basis. Professional follow-up care is the most important element in successful long term lens wear.

IN THE BEGINNING IT IS NORMAL IF:

1) Your lenses itch or feel funny.
2) One lens is more noticeable than the other.
3) Your vision seems fuzzier than with glasses.
4) One eye sees better than the other.
5) You have trouble handling your lenses.

REMOVE AND DO NOT SLEEP IN YOUR LENSES IF:

1) You develop unusual pain or redness.
2) You develop unusually cloudy or foggy vision.
3) You experience a decrease in vision that does not clear up.
4) You suspect something is wrong.

WEARING SCHEDULE

_____

_____

_____

_____

_____

_____

Next appointment: _____

Date _____

_____
Dispenser

_____
Patient

APPENDIX B

INFORMED CONSENT FORM

INFORMED CONSENT FORM

1. INSTITUTION

A. TITLE OF PROJECT:	a. The Effect of Extended Wear Contact Lenses on Corneal Thickness and the Endothelial Layer. b. Changes in Oxygen Transmissibility (DK/L) in Extended Wear Contact Lenses with Time. c. The Effect of Extended Wear Contact Lenses on Contrast Sensitivity Function with Time.
B. PRINCIPAL INVESTIGATORS:	a. David Marrs 357-4026 b. Tim Allen 357-3953 c. Gary Slater 357-8378
C. ADVISOR:	Dr. Don West 357-9036
D. LOCATION:	Pacific University College of Optometry Forest Grove, Oregon
E. DATE:	1985 - 1986

2. DESCRIPTION OF PROJECT

This project is designed to observe, monitor and record (1) the effects of extended wear contact lenses on corneal thickness and the endothelial layer. (2) The changes in oxygen transmissibility (DK/L) of extended wear contact lenses with time. (3) The effect of extended wear contact lenses on contrast sensitivity function with time. This will be accomplished by fitting extended wear contact lenses on human subjects and monitoring and measuring the above items.

3. DESCRIPTION OF RISKS

Participants will be at no greater risk than if fit with contact lenses in a normal clinical situation. As with all contact lens wearers, participants will experience a normal adaptation period during which symptoms may occur. Several clinical instruments will be used in close proximity to the eye, presenting a minor risk of contact injury. These instruments are routinely used by optometrists, and the investigators are extensively trained in their use.

4. DESCRIPTION OF BENEFITS

This study will serve to increase the basic understanding of the response of the eye to extended wear contact lenses. It will further allow study of the changes in oxygen transmission of the lenses as a function of the wearing time. The study will also determine the effect of extended wear contact lenses on visual performance with time. This study will help to determine the efficacy of the extended wear lens and be useful in establishment of the optimum fitting and wearing programs for the extended wear contact lens. All examination fees will be waived for all participants, and those completing the study will receive an additional pair of extended wear contact lenses. Since the study involves careful monitoring of changes, participants will receive care that is equal to or more intensive than that received by routine contact lens patients.

5. COMPENSATION AND MEDICAL CARE

If you are injured in this experiment it is possible that compensation or medical care will not be available from Pacific University, the experimenters, or any organization associated with the experiment. All reasonable care will be used to prevent injury.

6. ALTERNATIVES ADVANTAGEOUS TO SUBJECTS

Participants may find it advantageous to pursue fitting with an alternative brand or type of contact lens or spectacles. If it is determined that such an alternative would be advantageous, a referral will be made to the general clinic of Pacific University College of Optometry.

7. OFFER TO ANSWER ANY INQUIRES

The experimenter will be pleased to answer any questions that might arise at any time during the course of this study. If you are not satisfied with the answers you receive, please call Dr. James Peterson at 357-0442. During participation in this research project you are not considered a clinic patient. All questions should be directed to the researchers and/or the faculty advisor who will be solely responsible for any treatment, except in the case of an emergency.

8. FREEDOM TO WITHDRAW

You are free to withdraw your consent and to discontinue participation in this project or activity at any time without prejudice.

I have read and understand the above. I am 18 years of age or over (or this form is signed for me by my parent or guardian).

PRINTED NAME_____

SIGNED_____DATE_____

ADDRESS_____PHONE_____

CITY_____STATE/ZIP_____

NAME AND ADDRESS OF A PERSON NOT LIVING WITH YOU WHO WILL ALWAYS KNOW YOUR ADDRESS_____

_____

APPENDIX C

CONTACT LENS FORMS
SAM (SLATER, ALLEN, MARRS) FORMS
1 THROUGH 8

CONTACT LENS FITTING FORM

NAME _____ I.D. NUMBER_____

DATE_____

SUBJECTIVE:

OD

OS

K's OD OS

PUPIL SIZE _____ CORNEAL DIAMETER _____

PALPEBRAL FISSURE _____ TEAR BUT _____

DIAGNOSTIC FITTING

TRIAL 1 LENS - OD_____ TRIAL 2 LENS - OD_____
OS_____ OS_____

		COVERAGE	CENTER	MOVEMENT	OVER K	OVER RET	OVER REF
TRIAL 1	OD						
	OS						
TRIAL 2	OD						
	OS						

SLIT LAMP _____

FINAL CONTACT LENS PRESCRIPTION

	BASE CURVE	DIAMETER	POWER	MANUFACTURE
OD				
OS				

CONTACT LENS FOLLOWUP FORM

PATIENT NAME_____ I.D. NUMBER_____

DATE_____ VISIT_____DAYS

DISCUSSION_____

_____

_____

___ CLASON VA - C.L. - OD 20/_____OS 20/_____OU 20/_____

Spec. - OD 20/_____OS 20/_____OU 20/_____

OVER REFRACTION - OD_____ OS_____

___ CSF - SEE ATTACHED

___ AUTO REFRACTION (WITH LENS) - SEE ATTACHED NUMBER _____

___ AUTO "K" (WITH LENS) - SEE ATTACHED NUMBER_____

___ SLIT LAMP - Injection___ Neo-Vascularization___ Iritis___ Edema___ Staining___

_____

___ OD - DK/L _____ L _____ DK _____ HUM _____ TEMP _____

OS - DK/L _____ L _____ DK _____ HUM _____ TEMP _____

___ ENDO PHOTO - _____PER SQ MM - FIXATION OD _____° OS_____°

___ PACHOMETRY

___ AUTO REFRACTION (WITHOUT LENS) - SEE ATTACHED NUMBER _____

___ AUTO "K" (WITHOUT LENS) - SEE ATTACHED NUMBER _____

___ CORNEASCOPE - PHOTO ATTACHED

___ B&L "K" - OD _____@_____ , _____@_____

OS _____@_____ , _____@_____

___ IOP - NCT - OD _____ OS _____

NOTES - _____

_____

_____

_____

NEXT APPOINTMENT_____

PERFORMANCE DEPTH PERCEPTION TEST

KEYSTONE DIAGNOSTIC SERIES - AVIATORS UNIT

NAME_____ I.D. NUMBER_____

BASELINE (PRE-CONTACT LENS WEAR)

SLIDE #_____

PERCENT STEREOPSIS_____

SECONDS OF ARC_____

EXAMINER_____

DATE_____

FINAL (POST-CONTACT LENS WEAR)

SLIDE #_____

PERCENT STEREOPSIS_____

SECONDS OF ARC_____

EXAMINER_____

DATE_____

COMMENTS_____

PHOTO RECORD

PHOTO #	PATIENT'S NAME	ID #	EYE	NOTE	FRAME
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

ROLL NUMBER _____

DATE TO LAB _____

RECEIVED FROM LAB _____

SAM FORM 4, 5 AUG 85

CONTROL PATIENT FORM

PATIENT NAME_____ I.D. NUMBER_____

DATE_____ VISIT_____DAYS

DISCUSSION_____

_____

____ CLASON VA - Spec. - OD 20/_____ OS 20/_____ OU 20/_____

REFRACTION - OD _____ OS _____

____ CSF - SEE ATTACHED

____ ENDO PHOTO - _____PER SQ MM - FIXATION OD _____° OS_____°

____ PACHOMETRY

____ AUTO REFRACTION (WITHOUT LENS)

____ AUTO "K" (WITHOUT LENS)

____ CORNEASCOPE - PHOTO ATTACHED

____ B&L "K" - OD _____@_____ , _____@_____

OS _____@_____ , _____@_____

____ IOP - NCT - OD _____ OS _____

NOTES -_____

DEPTH PERCEPTION TEST_____

NEXT APPOINTMENT_____

PACIFIC UNIVERSITY
COLLEGE OF OPTOMETRY
2043 COLLEGE WAY
FOREST GROVE, OR 97116

EXTENDED WEAR CONTACT LENS RESEARCH
CONTACT LENS INFORMATION

PATIENT_____

Original "K" O.D._____ Latest "K" O.D _____

Date_____ O.S._____ Date_____ O.S._____

Spectacle Rx O.D._____ Latest Refraction O.D._____

Date_____ O.S._____ Date_____ O.S._____

CURRENT SOFT LENS SPECIFICATIONS

Date Prescribed_____Manufacturer_____

	Base	Power	Diameter	VA
O.D.				20/
O.S.				20/

PRESCRIPTION IS VALID FOR SIX MONTHS FROM DATE PRESCRIBED

EXTENDED WEAR CONTACT LENS PATIENT QUESTIONNARIE

1. Do you feel that you received adequate and professional care during the research period? YES_____ NO_____ COMMENT ____
   _____

2. Are there any changes you would suggest in future research projects of this nature? YES_____ NO_____ COMMENT_____
   _____

3. Do you plan to remain an extended wear contact lens wearer? YES_____ NO_____ COMMENT_____
   _____

4. Would you be interested in participating in another research project? YES_____ NO_____ COMMENT_____
   _____

5. Did you have any problems in following the instructions given during the research period? YES_____ NO_____ COMMENT_____
   _____

6. Did you have a preference between your right and left lenses during the study with . . .
   a. Vision - Right_____ Left_____ No Difference_____
   b. Comfort - Right_____ Left_____ No Difference_____
   c. Ease of Handling - Right_____ Left_____ No Difference_____
   Comments_____

PACIFIC UNIVERSITY
COLLEGE OF OPTOMETRY
2043 COLLEGE WAY
FOREST GROVE, OR 97116

EXTENDED WEAR CONTACT LENS RESEARCH
CONTACT LENS INFORMATION

PATIENT_____

1. Recommend you continue to follow the contact lens care procedures that where prescribed at the beginning of this study.

2. Recommend you have continuing follow-up examinations at 90 day (3 months) to 180 day (6 months) intervals.

3. Recommend you wear your contact lenses in the following manner:

_____

I have read and understand the above. I have received a new pair of contact lenses and the prescription for these lenses.

_____
Signature

_____
Date

APPENDIX D

PACHOMETER COMPUTER PROGRAM

```
]LIST

 10  REM ************************************
 11  REM CONTACT LENS RESEARCH HELLO PROGRAM
 12  REM CREATED FOR PACIFIC UNIVERSITY
 13  REM COPYRIGHT (C) 1985 BY KEVIN SPREIER
 14  REM VERSION 1.1  09 SEP 85
 15  REM ************************************
 100 D$ =  CHR$ (4):G$ =  CHR$ (7): TEXT : HOME : PRINT D$"NOMONC,I,O": POKE
      - 17814,8: POKE  - 17807,8
 110  FOR I = 1 TO 39: PRINT "*";: NEXT : PRINT
 120  PRINT "*    Contact Lens Research Software    *"
 125  PRINT "* Copyright (c) 1985 by Kevin Spreier *"
 130  FOR I = 1 TO 39: PRINT "*";: NEXT : PRINT
 140  PRINT : PRINT
 150  HTAB 7: PRINT "Options:": PRINT
 160  READ N
 165  FOR I = 1 TO N
 170  READ N$(I),ADDRESS(I)
 175  HTAB 10: PRINT I") "N$(I)
 180  NEXT I
 200  HTAB 10: PRINT I") Exit to BASIC"
 330  PRINT : HTAB 7: PRINT "Choose one -->";
 340  GET A$:A =  ASC (A$) - 48: IF A < 1 OR A > I THEN  PRINT G$;: GOTO
     340
 350  PRINT A$
 360  IF A = I THEN  HOME : END
 380  VTAB 9 + A: INVERSE : HTAB 13: PRINT N$(A);: NORMAL : PRINT
 385  POKE 47722,ADDRESS(A): POKE 47729,ADDRESS(A)
 390  PRINT D$"RUN"N$(A): END
 1000  DATA 3
 1005  DATA "PERMEOMETER",8
 1010  DATA "PACHOMETER",8
 1015  DATA "PACH.REPORT",8
```

```
]222
]LIST

 10  REM ******************************************
 11  REM PACHOMETER CREATED FOR PACIFIC UNIVERSITY
 12  REM  COPYRIGHT (C) 1985 BY KEVIN SPREIER
 13  REM   VERSION 1.4  03 SEP 85
 15  REM ******************************************
 18 X$ = "": REM Dummy variable for special INPUT$ routine
 19 INPT = 940: REM Special input routine to allow commas
 20 D$ =  CHR$ (4):G$ =  CHR$ (7): ONERR  GOTO 9005
 25  PRINT D$"BLOADINPUT$,A940"
 28 CAL = 3000: REM CALIBRATION FACTOR (1 MM=3000 A/D POINTS)
 29 BIAS = 810: REM .270 MM SYSTEM BIAS TO ADD TO ZERO POINT
 30 EYE = 0: REM INITIAL EYE=OD
 35 LED$ = "A":LED = 1:LD = 1: REM DEFAULT STARTING LIGHT
 40 S1 = 4: REM SLOT OF LED INTERFACE CARD
 41  POKE 49280 + S1 * 16,7: REM TURN ON "A" LED INITIALLY
 45 S2 = 3: REM SLOT OF A/D CARD
 46 AI13 =  - 16256 + S2 * 16: REM A/D CARD I/O PORT
 47  POKE AI13,18: REM DO A DUMMY A/D CONVERSION
 50  DIM L(16): REM LED POSITION TRANSLATION TABLE
 55  DATA 7,0,1,2,3,4,5,6,9,10,11,12,13,14,15,8
 60  FOR I = 1 TO 16: READ L(I): NEXT : REM READ IN LED TABLE
 61  DIM X%(17),Y%(17): REM LED SCREEN COORDINATES
 62  DATA 20,24,25,24,20,16,15,16,20,22,22,22,20,18,18,18,20
 63  DATA 9,10,12,14,15,14,12,10,11,11,12,13,13,13,12,11,12
 64  FOR I = 1 TO 17: READ X%(I): NEXT : FOR I = 1 TO 17: READ Y%(I): NEXT

 75  DIM DT%(1,17,12): REM POTENTIOMETER A/D RAW DATA ARRAY
 80  DIM DT(1,17,3): REM CALC. DATA
 85 DR = 2: REM DATA DISK DRIVE #
 99  REM ***MAIN MENU
100  TEXT : HOME
105  FOR I = 1 TO 39: PRINT "*";: NEXT : PRINT
110  HTAB 11: PRINT "Pachometer Program"
115  HTAB 3: PRINT "Copyright (c) 1985 by Kevin Spreier"
116  FOR I = 1 TO 39: PRINT "*";: NEXT : PRINT
117  PRINT : PRINT
118  POKE 34,4: REM SET TOP OF SCROLL WINDOW
119  IF FIRST <  > 0 THEN 130: REM SKIP CALIBRATION IF NOT FIRST TIME TH
    ROUGH
120 FIRST = 1
121  PRINT "New zero mark (Y/N) N";
122  HTAB 20: INPUT A$: IF A$ = "" THEN A$ = "N"
124  IF A$ <  > "Y" AND A$ <  > "y" AND A$ <  > "N" AND A$ <  > "n" THEN
     PRINT G$;: GOTO 122
125  VTAB  PEEK (37): HTAB 21: PRINT A$
126  IF A$ = "N" OR A$ = "n" THEN  PRINT D$"OPENPACHOMETER.ZERO": PRINT
    D$"READPACHOMETER.ZERO": INPUT ZERO: PRINT D$"CLOSEPACHOMETER.ZERO":
     GOTO 130
127  PRINT : INPUT "Zero Pachometer head and press <RETURN>:";A$
128  POKE AI13,18:ZERO =  PEEK (AI13 + 1) * 256 +  PEEK (AI13) + BIAS: REM
    ADD BIAS TO NEW ZERO VALUE
129  PRINT D$"OPENPACHOMETER ZERO": PRINT D$"WRITEPACHOMETER.ZERO": PRINT
    ZERO: PRINT D$"CLOSEPACHOMETER.ZERO"
130  PRINT "Subject name:?";SUB$;
133  HTAB 15: CALL INPT:A$ =  MID$ (X$,1): REM Input string with commas
134  IF A$ = "" THEN  VTAB  PEEK (37): HTAB 15: PRINT SUB$: GOTO 139
136 SUB$ = A$
139  PRINT "Id #: ";ID$;
```

```
139  PRINT "Id #: ";ID$;
142  HTAB 6: INPUT A$: IF A$ = "" THEN  VTAB  PEEK (37): HTAB 7: PRINT I
    D$: GOTO 148
145 ID$ = A$
148  PRINT "Date: ";DT$;
151  HTAB 6: INPUT A$: IF A$ = "" THEN  VTAB  PEEK (37): HTAB 7: PRINT D
    T$: GOTO 157
154 DT$ = A$
157  PRINT : PRINT "Eye (1=OD, 2=OS): ";
160  IF EYE = 0 THEN  PRINT "OD";
163  IF EYE = 1 THEN  PRINT "OS";
166  HTAB 18: INPUT A$: IF A$ = "" THEN 172
169 EYE =  VAL (A$) - 1
172  VTAB  PEEK (37): HTAB 19: IF EYE = 0 THEN  PRINT "OD"
175  IF EYE = 1 THEN  PRINT "OS"
180  HOME : VTAB 9
181  HTAB 15: PRINT "      A      "
182  HTAB 15: PRINT " H         B "
183  HTAB 15: PRINT "    P I J    "
184  HTAB 15: PRINT "G   O Q K   C"
185  HTAB 15: PRINT "    N M L    "
186  HTAB 15: PRINT " F         D "
187  HTAB 15: PRINT "      E      "
188  POKE 34,16: REM SET TOP OF SCROLL WINDOW
189 KEY = 1:OKEY = 1: REM INITIAL KEYPRESS VALUE
199  REM ***MAIN PROGRAM LOOP
200  IF KEY < 0 THEN 210: REM SKIP LIGHT DISPLAY IF NON-LIGHT KEY PRESSE
    D
201  IF OKEY > 0 AND KEY < 17 THEN  VTAB Y%(OKEY): HTAB X%(OKEY): PRINT
     CHR$ (OKEY + 64): REM TURN OFF PREVIOUS SCREEN CHAR.
202  INVERSE
204  VTAB Y%(KEY): HTAB X%(KEY): IF KEY = 17 THEN  IF C < 16 THEN  NORMAL

205  IF KEY = 17 THEN  PRINT "Q": GOTO 210
206  PRINT LED$: REM LIGHT SCREEN CHAR.
210  NORMAL : VTAB 6: PRINT " ";: IF EYE = 0 THEN  PRINT "OD";
211  IF EYE = 1 THEN  PRINT "OS";
213  PRINT " Light #: ";
214  IF C > 15 THEN  PRINT "Q";: GOTO 217
215  PRINT LED$;
217  HTAB 26: PRINT "<ESC>=New eye"
218  HTAB 25: PRINT "^D=Delete point"
219  REM **KEYBOARD HANDLER
220  IF KEY > 0 AND KEY < 17 THEN OKEY = KEY
221  VTAB 6: HTAB 14
222  IF  PEEK (49249) > 127 THEN  PRINT G$: GOTO 275: REM PUSHBUTTON PRE
    SSED
223  IF  PEEK (49152) < 128 THEN 222: REM LOOP UNTIL KEY PRESSED
224 KEY =  PEEK (49152) - 192: POKE 49168,0:A$ =  CHR$ (KEY + 64): IF KE
    Y =  - 51 THEN  VTAB  PEEK (37) + 1: HTAB 10: PRINT : GOTO 270: REM
    RETURN KEY PRESSED
225  IF KEY =  - 32 THEN  PRINT : GOTO 275: REM SPACE KEY PRESSED
230  IF KEY =  - 37 THEN  PRINT : GOTO 440: REM ESC KEY PRESSED
231  IF KEY =  - 60 THEN  PRINT : GOTO 1000
235  IF KEY < 1 OR KEY > 17 THEN  PRINT G$;: GOTO 221
240  IF KEY = 17 THEN C = C + 16: IF C > 16 THEN C = 0
245  IF KEY <  > 17 THEN LED = KEY:LED$ = A$
270  POKE 49280 + S1 * 16,L(LED) + C: REM TURN ON LED
271  GOTO 300: REM SKIP A/D CODE
274  REM READ PACHOMETER HEAD POSITION
275  POKE AI13,18:N = DT%(EYE,LD,0) + 1
276  IF N > 12 THEN N = 12: VTAB 24: HTAB 7: PRINT G$G$"Maximum # of sam
    ples = 12": GOTO 200
280 DT%(EYE,LD,N) =  PEEK (AI13 + 1) * 256 +  PEEK (AI13) - ZERO:DT%(EYE
    ,LD,0) = N
```

```
301  IF C / 15 THEN LD = 17: PRINT "Q";: GOTO 304
302  PRINT LED$;
304  PRINT "' Data (mm):"
305 N = DT%(EYE,LD,0): REM # OF SAMPLES
310 K = 0: FOR I = 1 TO N STEP 4
312  FOR J = 0 TO 3
315  IF K >  = N THEN 320
316  HTAB 2 + J * 10: IF K > 8 THEN  HTAB  PEEK (36)
317  PRINT K + 1;":"; INT (DT%(EYE,LD,K + 1) / CAL * 1000) / 1000;:K = K
     + 1
320  NEXT J
325  PRINT : NEXT I
349  REM CALCULATE STATISTICS
350 MN = 0:SD = 0:RG = 0:SQ = 0
353  IF N = 0 THEN 390
354 HI% = DT%(EYE,LD,1):LO% = HI%
355  FOR I = 1 TO N
360 D% = DT%(EYE,LD,I):MN = MN + D%:SQ = SQ + D% * D%
365  IF D% < LO% THEN LO% = D%
370  IF D% > HI% THEN HI% = D%
375  NEXT I
380 SD =  SQR (SQ - (MN * MN / N)) / CAL
381 MN = MN / N / CAL
382 RG = (HI% - LO%) / CAL
390  PRINT : PRINT " Mean:"; INT (MN * 1000 + .5) / 1000;: HTAB 13: PRINT
     "  S.D.:"; INT (SD * 1000 + .5) / 1000;: HTAB 26: PRINT "  Range: ";
     INT (RG * 1000 + .5) / 1000
395 DT(EYE,LD,1) = MN:DT(EYE,LD,2) = SD:DT(EYE,LD,3) = RG
400  GOTO 200
415  HTAB 7: INPUT "Press (RETURN) to continue:";A$
440  POKE 34,7: HOME
442 S$ = "N": IF EYE = 1 THEN S$ = "Y"
444 EYE = EYE + 1: IF EYE > 1 THEN EYE = 0
450  PRINT "Save data (Y/N): "S$;
455  HTAB 17: INPUT A$: IF A$ = "" THEN 470
460  IF A$ <  > "Y" AND A$ <  > "y" AND A$ <  > "N" AND A$ <  > "n" THEN
     PRINT G$;: GOTO 450
465 S$ = A$
470  IF S$ = "Y" OR S$ = "y" THEN 500
490  GOTO 100
500 FI$ =  LEFT$ (SUB$,1) + ID$ + ".PACH." + DT$
505  PRINT "Filename: "FI$;
510  HTAB 10: INPUT A$: IF A$ = "" THEN  VTAB  PEEK (37): HTAB 11: PRINT
    FI$: GOTO 520
515 FI$ = A$
520  PRINT "Drive #: "DR;
521  HTAB 9: INPUT A$: IF A$ = "" THEN  VTAB  PEEK (37): HTAB 10: PRINT
    DR: GOTO 529
525 A =  VAL (A$): IF A < 1 OR A > 2 THEN  VTAB  PEEK (37): PRINT G$;: GOTO
    521
526 DR = A
529  PRINT "Saving data..."
530  PRINT D$"OPEN"FI$",D"DR: PRINT D$"WRITE"FI$
535  PRINT SUB$: PRINT ID$: PRINT DT$
538  PRINT CAL: PRINT ZERO
540  PRINT "OD": FOR I = 1 TO 17: FOR J = 1 TO 3: PRINT DT(0,I,J): NEXT
    J: NEXT I
545  PRINT "OS": FOR I = 1 TO 17: FOR J = 1 TO 3: PRINT DT(1,I,J): NEXT
    J: NEXT I
550  PRINT "OD": FOR I = 1 TO 17: FOR J = 0 TO DT%(0,I,0): PRINT DT%(0,I
    ,J): NEXT J: NEXT I
555  PRINT "OS": FOR I = 1 TO 17: FOR J = 0 TO DT%(1,I,0): PRINT DT%(1,I
    ,J): NEXT J: NEXT I
560  PRINT D$"CLOSE"FI$
565  VTAB  PEEK (37): HTAB 15: PRINT "finished."
570  PRINT : PRINT "Exit program (Y/N): "S$;
```

```
580  IF A$ <  > "Y" AND A$ <  > "y" AND A$ <  > "N" AND A$ <  > "n" THEN
     PRINT G$;: GOTO 575
585 S$ = A$
590  IF S$ = "N" OR S$ = "n" THEN 100
595  PRINT D$"RUNHELLO,D1"
999  REM DELETE A DATA POINT
1000  PRINT "Delete data #: ";
1001  HTAB 16: INPUT A$: IF A$ = "" THEN 1020
1003 PT =  VAL (A$): IF PT < 1 OR PT > 12 THEN  VTAB  PEEK (37): PRINT G
    $;: GOTO 1001
1004  IF PT = N THEN 1015
1005  IF PT > N THEN 1020
1009  FOR I = PT TO 11
1010 DT%(EYE,LD,I) = DT%(EYE,LD,I + 1): REM SHIFT  A DOWN BY 1
1014  NEXT I
1015 N = N - 1:DT%(EYE,LD,0) = N
1020  VTAB  PEEK (37): HTAB 1: PRINT "                          ": REM ERASE LI
    NE
1025  GOTO 300: REM REDRAW DATA
9000  REM General purpose error handler
9005  TEXT :I =  PEEK (222): PRINT G$"Error: ";: IF I = 0 OR I > 15 THEN
    J = 53856 + I: GOTO 9015
9010 J = 43377 +  PEEK (43583 + I)
9015  IF I = 254 THEN  PRINT "Bad input";
9020  IF I = 255 THEN  PRINT "Cntrl C attempted.": GOTO 9040
9025 K =  PEEK (J): PRINT  CHR$ (K);: IF K < 192 THEN J = J + 1: GOTO 90
    25
9030  PRINT " at line "; PEEK (218) + 256 *  PEEK (219): IF I = 10 THEN
     PRINT D$"UNLOCK"FI$: PRINT "File has been unlocked. Try again."
9035  IF I = 4 OR I = 8 OR I = 9 THEN  PRINT "Insert another disk and tr
    y again.": GOSUB 9050: RESUME
9040  POKE 216,0: GOSUB 9050: GOTO 100
9050  HTAB 7: INPUT "Press <RETURN> to continue: ";A$: RETURN

]
```

```
]LIST

 10  REM ******************************************
 15  REM PACH.REPORT Created for Pacific University
 17  REM  Copyright (c) 1985 by Kevin Spreier
 20  REM   Version 1.02   09 Sep 85
 25  REM ******************************************
 30 X$ = "": REM Dummy variable for special INPUT$ routine
 35 INPT = 940: REM Special input routine to allow commas
 50 D$ =  CHR$ (4):G$ =  CHR$ (7):E$ =  CHR$ (27)
 55  PRINT D$"BLOADINPUT$,A940"
 58 PR = 1: REM Default printer interface slot
 60 DR = 2: REM Default data drive
 65  DIM DT(1,17,3): REM Calculated data array
 90  PRINT D$"PR#3": REM Enable 80-column card
 100  REM  Menu selection
 105  POKE 49168,0: REM Clear keyboard strobe
 110  PRINT  CHR$ (17): REM Display 40 columns
 115  TEXT : HOME : GOSUB 985: HTAB 7: PRINT "Pachometer Report Generator
     ": HTAB 3: PRINT "Copyright (c) 1985 by Kevin Spreier": GOSUB 985: VTAB
     8: ONERR  GOTO 1005
 119  POKE 34,5: REM Don't scroll over top 4 screen lines
 120  PRINT
 125  IF FIRST <  > 0 THEN 200: REM Skip questions if not first time thro
     ugh
 130 P = 0: PRINT "Do you want a printout? Y";
 131  HTAB 25: INPUT "";A$: IF A$ = "" THEN A$ = "Y"
 132  IF A$ = "Y" OR A$ = "y" THEN P = 1: GOTO 135
 133  IF A$ <  > "N" AND A$ <  > "n" THEN  PRINT G$;: GOTO 131
 135  VTAB  PEEK (37): HTAB 25: PRINT A$
 160  PRINT : PRINT "Insert data disk in drive "DR" and": PRINT "  press
     <RETURN>: ";
 161  INPUT "";A$
 195 FIRST = 1
 200  HOME :T =  PEEK (34): PRINT
 205  PRINT D$"CATALOG,D"DR
 210  FOR V =  PEEK (34) TO  PEEK (37) + 1: VTAB V: HTAB 5
 215 CH =  PEEK (( PEEK (40) +  PEEK (41) * 256) +  PEEK (36)): IF CH = 1
     60 THEN T = T + 1: NEXT V: GOTO 225
 220  HTAB 4: PRINT "-"; CHR$ (V - T + 65);"-";: NEXT V
 225  POKE 49168,0: PRINT "Enter letter (1,2=Dr; <RET>=Done):";
 230  GET A$:A =  ASC (A$): IF A = 49 OR A = 50 THEN DR = A - 48: GOTO 20
     0
 231  IF A = 13 THEN 900: REM Return key pressed
 232  IF A > 96 THEN A = A - 32: REM Convert lower case letters to upper
     case
 233  IF A - 64 > (V - T) OR A - 65 < 0 THEN  PRINT G$;: GOTO 230
 235  VTAB A + T - 66: HTAB 2:CH =  PEEK (( PEEK (40) +  PEEK (41) * 256)
      +  PEEK (36)): IF CH <  > 212 THEN  PRINT G$;: GOTO 230
 240  HTAB 8:FI$ = "":LCHAR = 0:SPCNT = 0
 241  FOR X =  PEEK (36) TO 39
 242 CH =  PEEK (( PEEK (40) +  PEEK (41) * 256) + X): IF CH = 160 THEN  IF
     LCHAR = 160 THEN SPCNT = SPCNT + 1
 244  IF SPCNT = 6 THEN FI$ =  LEFT$ (FI$, LEN (FI$) - 2): GOTO 250
 245 FI$ = FI$ +  CHR$ (CH):LCHAR = CH: NEXT X
 250  HTAB 8: INVERSE : PRINT FI$: NORMAL
 299  REM Read data from file
 310  PRINT D$"OPEN"FI$
```

```
315  PRINT D$"READ"FI$
320  CALL INPT:SUB$ =  MID$ (X$,1): REM Input string with commas
322  INPUT ID$: INPUT DT$
324  INPUT CAL: INPUT ZERO
325  INPUT OD$: FOR I = 1 TO 17: FOR J = 1 TO 3: INPUT DT(0,I,J): NEXT J
     : NEXT I
330  INPUT OS$: FOR I = 1 TO 17: FOR J = 1 TO 3: INPUT DT(1,I,J): NEXT J
     : NEXT I
335  PRINT D$"CLOSE"FI$
395  PRINT : REM Fix enhanced 80-col. bug
399  REM Print report
400  PRINT  CHR$ (18): POKE 34,0: HOME : REM Display 80 columns and clea
     r screen
401  IF P = 0 THEN 410
405  PRINT D$"PR#"PR: REM Turn printer on
410  PRINT "Name: "SUB$
415  PRINT "Id #: "ID$
420  PRINT "Date: "DT$
421  PRINT
422  PRINT  SPC( 13);"-OS (mm)-"; SPC( 31);"-OD (mm)-"
423  PRINT
425  PRINT  SPC( 6);"Mean"; SPC( 5);"Range"; SPC( 6);"S.D."; SPC( 16);"M
     ean"; SPC( 5);"Range"; SPC( 6);"S.D."
426  PRINT  SPC( 6);"----"; SPC( 5);"-----"; SPC( 6);"----"; SPC( 16);"-
     ---"; SPC( 5);"-----"; SPC( 6);"----"
428  FOR I = 1 TO 17: REM Print LED data
429  REM OS data
430 D = DT(1,I,1): IF D = 0 THEN  IF DT(0,I,1) = 0 THEN 475: REM Don't p
     rint a line if both OS, OD values are 0
435  PRINT  CHR$ (I + 64)":   ";: REM Label LED #
436  IF D = 0 THEN  PRINT  SPC( 35);: GOTO 455: REM No data for that spe
     cific OS LED
440  GOSUB 800: REM Print data value
445  FOR J = 2 TO 3:D = DT(1,I,J): GOSUB 800: NEXT J
449  REM OD data
450  PRINT  SPC( 5);: REM Space between eyes
455 D = DT(0,I,1): PRINT  CHR$ (I + 64)":   ";: REM Label LED #
457  IF D = 0 THEN 470: REM No data for that specific OD LED
460  GOSUB 800: REM Print data value
465  FOR J = 2 TO 3:D = DT(0,I,J): GOSUB 800: NEXT J
470  PRINT
475  NEXT I
480  IF P = 0 THEN  GOSUB 995
481  IF P = 1 THEN  PRINT  CHR$ (12): REM Send form-feed char. to printe
     r
485  PRINT D$"PR#3": REM Turn printer off and clear screen
490  GOTO 100
799  REM Print the variable D in the format "0.000"
800 D =  INT (D * 1000 + .5): IF D > 1000 THEN D = D - 1000: PRINT "1.";
     : GOTO 810
805  PRINT "0.";
810  IF D < 100 THEN  PRINT "0";: IF D < 10 THEN  PRINT "0";
815  PRINT D; SPC( 5);
820  RETURN
899  REM Go back to main menu
900  PRINT : PRINT : PRINT "Exit program (Y/N): Y";
905  HTAB 21: INPUT "";A$: IF A$ = "" THEN A$ = "Y"
910  IF A$ <  > "Y" AND A$ <  > "y" AND A$ <  > "N" AND A$ <  > "n" THEN
     PRINT G$;: GOTO 905
915  IF A$ = "N" OR A$ = "n" THEN FIRST = 0: GOTO 100
916  VTAB  PEEK (37): HTAB 21: PRINT A$
920  PRINT D$"RUNHELLO,D1"
985  FOR I = 1 TO 39: PRINT "*";: NEXT : PRINT : RETURN
995  PRINT : HTAB 7: PRINT "Press any key to continue.";: GET A$: RETURN

1000  REM General purpose error handler
```

```
1005  POKE 216,0: TEXT :I =  PEEK (222): PRINT G$"Error: ";: IF I = 0 OR
    I > 15 THEN J = 53856 + I: GOTO 1015
1010 J = 43377 +  PEEK (43583 + I)
1015  IF I = 254 THEN  PRINT "Bad input";
1020  IF I = 255 THEN  PRINT "Cntrl C attempted.": GOTO 1040
1025 K =  PEEK (J): PRINT  CHR$ (K);: IF K < 192 THEN J = J + 1: GOTO 10
    25
1030  PRINT " at line "; PEEK (218) + 256 *  PEEK (219): IF I = 10 THEN
     PRINT D$"UNLOCK"FI$: PRINT "File has been unlocked. Try again."
1035  IF I = 4 OR I = 8 OR I = 9 THEN  PRINT "Insert another disk and tr
    y again.": GOSUB 995: RESUME
1040  GOSUB 995: GOTO 100

]
```

APPENDIX E

PACHOMETER INSTRUCTION MANUAL

PACHOMETER INSTRUCTION MANUAL

GENERAL DESCRIPTION

The purpose of the Pachometer is to provide the mechanical to electronic digital conversion, data analysis, operator interaction and the output functions necessary in order to accurately measure corneal thickness. The total measurement system consists of a slitlamp, a fixation device, an optical doubling device (with eyepiece), a potentiometer, and an Apple IIe (enhanced) computer.

The fixation device allows fixation of the patient to be changed at the discretion of the operator in eight (8) meridians and seventeen (17) locations. The fixation device contains nineteen (19) L.E.D.s (Light Emitting Diodes). There are seventeen (17) red L.E.D.s arranged in eight (8) meridians and two (2) yellow L.E.D.s that allow for fixation in the vertical plane to insure that readings are taken perpendicular to the cornea. Any one of the 17 red L.E.D.s may be illuminated at random from the Apple IIe keyboard. The two yellow L.E.D.s remain illuminated at all times to insure proper alignment.

The potentiometer assembly attaches to the slitlamp by slipping it on the mounting post used with a Goldman Applanation Tonometer. The potentiometer is slid over the large pin and is locked into place with the small short pin. The potentiometer is a device for measuring electromotive force or potential difference by comparison with a known voltage.

The bi-prism eyepiece is inserted into the right ocular of the slitlamp with the eyepiece slit in the horizontal orientation. This allows for vernier alignment of the upper and lower slits.

The Apple IIe computer along with the "Contact Lens Research Software" (Program written by Kevin Spreier) performs all of the analysis and hardware control functions. The computer receives all of the input from the potentiometer, performs the analysis, controls the fixation device, and provides the interface to the Apple Imagewriter Printer. The computer program computes the mean, standard deviation, and range of the current set of thickness samples. These items are recomputed after each measurement or after deleting a measurement. The computer and program also calibrates each measurement to compensate for operator biases in the measurement process.

OPERATING INSTRUCTION

Insert the program (floppy disk) titled Contact Lens Research Software into Drive 1 of the Apple IIe computer. Next insert a formatted disk into Drive 2 for data storage. Turn on the computer using the switch on the system saver on the left side of the computer. The computer screen will display the following:

```
**************************************************
*              Contact Lens Research Software    *
*              Copyright (c) 1985 by Kevin Spreier *
**************************************************

      Options:

         1. PERMEOMETER
         2. PACHOMETER
         3. PACH. REPORT
         4. Exit to BASIC

      Choose one -->
```

Press the "2" key on the keyboard and you will get the following on the computer screen:

```
**********************************************************
                  Pachometer Program
          Copyright (c) 1985 by Kevin Spreier
**********************************************************

     New zero mark (Y/N) ? N
```

It is advisable to zero the instrument each time a new operator uses the instrument. If you wish to zero the instrument press the "Y" key and then the "Return" key. The computer screen will then display the following:

```
**********************************************************
                  Pachometer Program
          Copyright (c) 1985 by Kevin Spreier
**********************************************************

     New zero mark (Y/N) ?
     Zero Pachometer head and press <RETURN>:
```

At this time turn on the slitlamp and insert the test (focus) bar into the slitlamp. Lightly grasp the adjustment rod from the potentiometer and while observing the narrow slit of light that is focused on the test bar, move the adjustment rod until the slit of light becomes straight and single. Figure 1 shows the proper alignment picture.

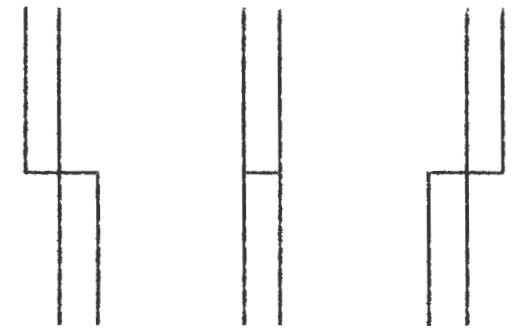


Figure 1

When the observer has established proper alignment of the slit then he/she should press the "RETURN" key. This is also the proper time to focus the eyepiece. The computer screen will then display the following:

Subject name: ?

Type in the name (Last name first) and press "RETURN".
The screen will then display the following:

Id #: ?

You may then enter up to a three (3) digit number to identify your patient. Again press the "RETURN" key and the screen will then display the following:

Date: ?

Enter the date and other information that may be desired i.e., Day 7 (of wearing extended wear contact lenses).
* The date line can only be one line long on the screen.*
Press the "RETURN" key and the screen will then appear as follows:

****

Pachometer Program
Copyright (c) 1985 by Kevin Spreier

****

Subject name: ? Doe, John D.
Id #: ? 123
Date: ? 15 Dec 99 Day 7

Eye (1=OD, 2=OS): ? OD

The computer program has preset the right eye to measure first, and you do not have to change this unless you do not need to measure the right eye or if you choose to measure the left first. If you are ready to measure the right eye simply press the "RETURN" key. The screen will then appear as follows:

```
**********************************************************
                  Pachometer Program
          Copyright (c) 1985 by Kevin Spreier
**********************************************************

OD Light #: A                          <ESC> = New eye
                                        /\ D = Delete Point

                        A
                    H       B
                      P I J
                  G   O Q K   C
                      N M L
                    F       D
                        E
```

You may then pick the fixation point that you want to measure by pressing the appropriate key. If you choose to measure central thickness first the press the "Q" key and the screen will appear as follows:

```
**********************************************************
                  Pachometer Program
          Copyright (c) 1985 by Kevin Spreier
**********************************************************

OD Light #: Q                          <ESC> = New eye
                                        /\ D = Delete Point

                        A
                    H       B
                      P I J
                  G   O Q K   C
                      N M L
                    F       D
                        E

'Q' Data (mm):

Mean: Ø              S.D.: Ø              Range: Ø
```

Up to twelve (12) values may be recorded in any of the fixation locations. If more than twelve (12) are attempted, the following will appear on the screen:

Maximum # of samples = 12

Due to the wiring of the fixation device, the central fixation point (Q) can only be illuminated in conjunction with another point. It is suggested that a peripheral point be selected and then the "Q". When finished with the central fixation point (Q), it is necessary to press the "Q" key to release that point and then make the next selection.

When all of the measurements have been completed for the right eye, press <ESC> and the screen will appear as follows:

****

Pachometer Program
Copyright (c) 1985 by Kevin Spreier

****

OD Light #: Q

<ESC> = New eye
/\ D = Delete Point

Save data (Y/N): ? N

If both eyes are to be measured then simply press "RETURN" and continue. If you only want to record the right eye then change the "N" to "Y" and press "RETURN". When continuing to record the left eye measurements the "Subject Name" line will appear with the name already recorded. Again press the "RETURN" key and the "Id #" will appear and so on until you again have the fixation select pattern. Simply follow the procedures outlined for the right eye in accomplishing the measurements for the left.

If a value is recorded that is significantly different than the others, it may be deleted. Press the "CONTROL" key simultaneously with the "D" key and then select the number of the value to be deleted and press the corresponding key followed by the "RETURN" key. The point will be deleted and the mean, S.D., and range values will be recalulated.

After measurements for both eyes have been completed, the values should be recorded on the data disk. Press the "ESC" key and the following will appear:

Save data (Y/N): ? Y

If you do want to save the data, simply press the "RETURN" key and the following appears:

Filename: ? D123 .PACH. 15DEC99 DAY 7

This represents the file for John Doe, Id # 123, taken on 15 Dec 99, and the information sequence of Day 7. Again press the "RETURN" key and the following will appear:

Drive #: ? 2

Since the Data Storage Disk is in drive 2, this is correct and you need only press the "RETURN" key. the following appears:

Saving data. . .

followed by the following when finished:

Saving data. . . finished

Exit program (Y/N): ? Y

If finished, press the "RETURN" key and you will return to the main menu. If another patient is to be measured, then change the "Y" to "N" and press "RETURN" and the sequence starts again.

PACHOMETER REPORT

In order to obtain a hard copy of the measurements taken, you must again view the main menu that appears as below:

```
**************************************************
*              Contact Lens Research Software    *
*              Copyright (c) 1985 by Kevin Spreier *
**************************************************

        Options:

           1. PERMEOMETER
           2. PACHOMETER
           3. PACH. REPORT
           4. Exit to BASIC

         Choose one - ->
```

Press The "3" key and the following screen will appear:

```
**********************************************************
              Pachometer Report Generator
          Copyright (c) 1985 by Kevin Spreier
**********************************************************

     Do you want a printout? Y
```

If you want a printout then press the "RETURN" key and the following appears:

```
     Insert data disk in drive 2 and press <RETURN>:
```

Once you have pressed the "RETURN" key the following will appear:

```
**********************************************************
              Pachometer Report Generator
          Copyright (c) 1985 by Kevin Spreier
**********************************************************
       T 005 D123 .PACH. 15DEC99  DAY 7
       T 005 M321 .PACH. 15DEC99  DAY 14
       T 005 J456 .PACH.  15DEC99  DAY 1
       T 005 C999 .PACH.  16DEC99  DAY 30
```

The above is an example of the Filenames that could appear on the data storage disk. The data disk will store approximately eighty (80) files. It will display eighteen (18) filenames at one time. If the one you are wishing to obtain is not on the screen, then press any key and the

following eighteen files will appear. Once you have found the file you need, Press the "CONTROL" key simultaneously with the "C" key and the screen will appear as below:

```
**************************************************
          Pachometer Report Generator
     Copyright (c) 1985 by Kevin Spreier
**************************************************
     T -A- D123 .PACH. 15DEC99  DAY 7
     T -B- M321 .PACH. 15DEC99  DAY 14
     T -C- J456 .PACH.  15DEC99  DAY 1
     T -D- C999 .PACH.  16DEC99  DAY 30
        ENTER LETTER (1,2 = DR; <RET> = DONE):
```

Again the screen will display all files that were previously seen, up to 18. Press the key corresponding to the letter between the dashes in front of the file you wish to copy. Be sure the printer is turned on. If the file is located on a disk where there are not yet eighteen (18) files, you will not have to press the "CONTROL" and the "C" keys as the computer will do it automatically. Also if the file is located in the last group of files displayed, the computer will accomplish this step. The following is an example of the report that will be printed.

Name: Doe, John
Id # : 123
Date : 15DEC99 day 7

	-OS (mm)-				-OD (mm)-		
	Mean	Range	S.D.		Mean	Range	S.D.
I:	0.526	0.010	0.013	I:	0.539	0.008	0.009
K:	0.521	0.008	0.010	K:	0.531	0.009	0.010
M:	0.515	0.009	0.012	M:	0.545	0.010	0.013
O:	0.533	0.012	0.012	O:	0.514	0.013	0.014
Q:	0.499	0.011	0.013	Q:	0.495	0.012	0.013

If when first entering PACH. REPORT and the question "Do you want a printout ? Y" appears and you do not want a printout, then change the "Y" to "N" and press "RETURN". Follow the same instructions as above and the report will appear on the screen in the same format as above.

When you are ready to exit the program, you must have the statement "Enter letter (1,2 = Dr; <RET> = Done):" at the bottom of the screen. Press the "RETURN" key and "Exit program (Y/N): Y" will appear. If you are ready

to exit the program, simply press the "RETURN" key and you will return to the main menu. If not ready to exit, change the "Y" to "N" and press the "RETURN" and the sequence will start again.

Always return to the main menu before quitting. Once the main menu is on the screen, remove both disks and then turn off the computer.

MEASUREMENT PROCEDURE

After preparing the slitlamp and choosing the fixation point desired, the observer is ready to take the thickness measurement. The fixation board has two functions. First, the two yellow L.E.D.s assure that the readings are taken perpendicular to the cornea. Second, the fixation board insures that the readings are taken at the same location on the cornea of each patient even on multiple sittings. The computer allows the observer to have immediate statistical feedback as to the accuracy of the readings being taken.

PATIENT INSTRUCTIONS

1. Inform the patient. Tell them that you are going to measure the thickness of the cornea but will not touch the eye.

2. Point out the Red L.E.D. that is illuminated (usually start with the center one). Ask the patient to maintain steady fixation on the L.E.D. that is illuminated.

3. Remind them to stay as still as possible with their forehead against the headrest.

4. Inform the patient that they may blink whenever they need to.

5. Inform the patient that they will hear a blep from the computer each time you take a reading.

TAKING THE MEASUREMENT

1. The observer's left hand should be on the slitlamp joy stick. The right hand on the potentiometer adjustment rod. Keeping the right elbow on the table is helpful in making a more steady adjustment during the measurement.

2. The observer may use either the right or the left eye when looking through the bi-prism eyepiece. The angle between the light beam and the microscope should be set at forty (40°) degrees, with the light beam to the left of the microscope.

3. Up to twelve (12) values may be recorded for each fixation point. Readjustments in alignment will be necessary throughout the collection of the values. The following is necessary befor each value is collected:

a. The slitlamp parallelpiped should be in the best possible focus, obtained by moving the slitlamp joy stick forward and backward. The observer will have to make minor adjustments to keep the sharpest focus at all times. The observer should first focus the inside surface of the upper image and then focus the inside surface of the lower image. One will always be slightly better than the other, so that the "best" focus is a compromise between the two.

b. The upper and lower yellow L.E.D.s should be an equal distance above and below the horizontal line of the bi-prism eyepiece as shown in figure 2. The yellow L.E.D.s should be superimposed by the split parallelpiped.

c. The red fixation L.E.D. should be positioned just above the horizontal line created by the bi-prism eyepiece when taking the central measurement. In most other positions, this is not possible and the red fixation L.E.D. should be as near as possible. It is assured that the readings being taken are perpendicular to the cornea as long as the yellow L.E.D.s are properly positioned.

d. To make an accurate reading, the inside surface of the upper and the lower parallelpiped images should be just touching, but not overlapping. Start the reading with the two surfaces well seperated and bring them together slowly until the observer sees first touch as shown in figure 2. If the surfaces do not touch or if they overlap, the observer will record an incorrect value (see figure 3).

e. Occlusion of the eye not being tested is helpful in maintaining accurate fixation. *The scale that is physically located on the potentiometer is not accurate when utilized with this computer setup.*

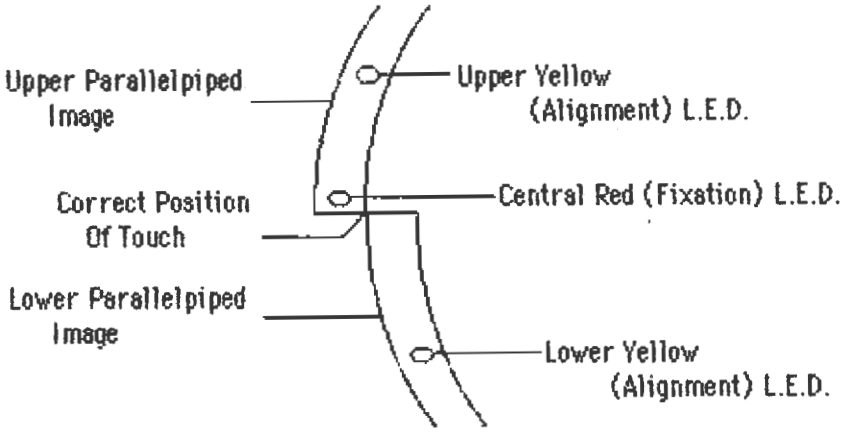


FIGURE 2

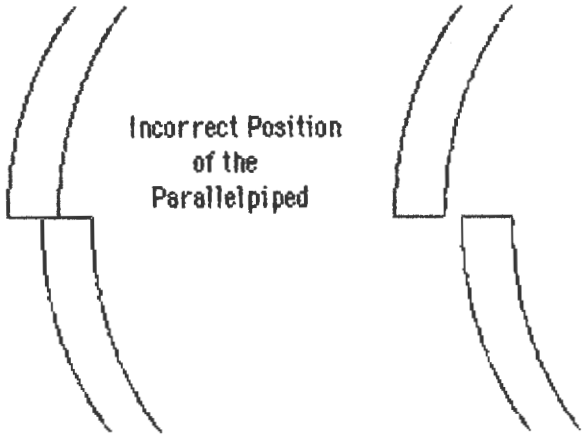


FIGURE 3

4. When all of the above (3., a.-d.) have been met, press the record button (located on top of the joy stick or the space bar on the computer) to record that value. After recording all of the values desired for that fixation point, choose the next fixation point and repeat the process.

APPENDIX F

PACHOMETRY SUBJECT DATA FILES AND CONTROL PATIENT DATA FILES

INFORMATION MISSING FROM PATIENT FILES

SUBJECT #	EYE	DAY	POINTS MISSING
101	OS	7	I
102	OU	7	ALL
103	OS	O	I, K
103	OU	4	ALL
104	OU	1	ALL
107	OS	14	I
109	OU	21	ALL
113	OU	4	ALL
119	OD	21	Q
119	OS	21	I
132	OD	118	I
133	OS	1	Q,O,K,M
133	OU	7	ALL
136	OU	21	ALL
137	OU	14	ALL
139	OU	7	ALL
139	OS	14	I,K

ABOVE DATA POINTS MISSING DUE TO MALFUNCTION OF COMPUTER CAUSING DATA STORAGE DISK TO BE OVER WRITTEN.

SUBJECT # 101 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.542	0.577	0.569	0.579	0.585
1	0.542	0.595	0.575	0.607	0.613
4	0.6	0.62	0.615	0.631	0.627
7	0.587	0.631	0.589	0.607	0.587
14	0.593	0.618	0.578	0.617	0.586
20	0.57	0.607	0.58	0.61	0.603
28	0.567	0.575	0.549	0.574	0.573

JOINED ARMY - DROPPED

SUBJECT # 101 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.56	0.574	0.579	0.567	0.584
1	0.534	0.561	0.59	0.531	0.577
4	0.585	0.569	0.606	0.581	0.598
7	0.531		0.561	0.554	0.554
14	0.555	0.599	0.601	0.571	0.58
20	0.58	0.589	0.6	0.568	0.57
28	0.546	0.576	0.565	0.566	0.552

JOINED ARMY - DROPPED

SUBJECT # 102 EYE: OD LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.495	0.54	0.541	0.545	0.545
1	0.482	0.494	0.503	0.516	0.525
4	0.511	0.512	0.498	0.521	0.539
7					
14	0.477	0.527	0.506	0.518	0.533
21	0.468	0.519	0.507	0.523	0.533
28	0.478	0.52	0.494	0.524	0.517
62	0.516	0.54	0.548	0.542	0.555
91	0.51	0.567	0.557	0.557	0.562
120	0.49	0.53	0.516	0.489	0.528
149	0.483	0.514	0.505	0.519	0.521

SUBJECT # 102 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.489	0.499	0.516	0.518	0.531
1	0.479	0.499	0.534	0.503	0.513
4	0.498	0.518	0.541	0.508	0.541
7					
14	0.492	0.525	0.512	0.49	0.508
21	0.483	0.5	0.525	0.504	0.512
28	0.468	0.505	0.53	0.51	0.528
62	0.504	0.532	0.561	0.534	0.545
91	0.523	0.568	0.568	0.548	0.56
120	0.461	0.499	0.507	0.478	0.505
149	0.495	0.527	0.521	0.495	0.532

SUBJECT # 103 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.488	0.512	0.513	0.531	0.528
1	0.525	0.573	0.579	0.583	0.585
4					
11	0.546	0.561	0.539	0.565	0.571
15	0.52	0.516	0.529	0.538	0.539
21	0.495	0.537	0.51	0.535	0.538
28	0.488	0.515	0.517	0.54	0.541
60	0.52	0.55	0.518	0.552	0.554
110	0.517	0.534	0.534	0.555	0.554
123	0.515	0.543	0.534	0.553	0.564
152	0.514	0.547	0.537	0.563	0.567

SUBJECT # 103 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.519		0.56		0.568
1	0.539	0.559	0.557	0.528	0.561
4					
11	0.547	0.576	0.567	0.536	0.561
15	0.508	0.522	0.552	0.509	0.529
21	0.502	0.52	0.525	0.481	0.533
28	0.503	0.532	0.53	0.512	0.547
60	0.539	0.548	0.573	0.512	0.571
110	0.531	0.552	0.567	0.512	0.558
123	0.523	0.518	0.56	0.528	0.554
152	0.535	0.562	0.58	0.532	0.555

SUBJECT # 104 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.534	0.556	0.551	0.563	0.558
1					
4	0.512	0.549	0.523	0.529	0.545
7	0.497	0.563	0.517	0.55	0.54
14	0.557	0.584	0.546	0.595	0.583
24	0.53	0.56	0.538	0.541	0.548
30	0.511	0.529	0.543	0.565	0.54
60	0.524	0.56	0.558	0.568	0.561
90	0.502	0.543	0.528	0.541	0.521
117	0.513	0.552	0.53	0.538	0.535

COMPLETED DAY 120 ONLY

SUBJECT # 104 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.534	0.568	0.574	0.547	0.557
1					
4	0.516	0.526	0.545	0.518	0.53
7	0.52	0.53	0.527	0.503	0.54
14	0.574	0.586	0.599	0.57	0.581
24	0.538	0.568	0.567	0.518	0.548
30	0.534	0.56	0.567	0.537	0.56
60	0.534	0.566	0.567	0.545	0.56
90	0.517	0.535	0.546	0.528	0.542
117	0.541	0.545	0.545	0.518	0.541

COMPLETED DAY 120 ONLY

SUBJECT # 105 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.505	0.517	0.514	0.566	0.55
1	0.489	0.541	0.533	0.534	0.558
4	0.53	0.559	0.56	0.587	0.582
7	0.529	0.54	0.557	0.575	0.553
14	0.521	0.504	0.51	0.547	0.545
21	0.532	0.546	0.543	0.585	0.589
31	0.56	0.568	0.568	0.588	0.602
60	0.54	0.551	0.55	0.565	0.597
90	0.522	0.56	0.561	0.586	0.573
125	0.538	0.554	0.556	0.58	0.596
151	0.54	0.548	0.56	0.585	0.59

SUBJECT # 105 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.523	0.534	0.55	0.518	0.547
1	0.536	0.522	0.566	0.542	0.541
4	0.576	0.576	0.585	0.58	0.579
7	0.55	0.57	0.589	0.566	0.591
14	0.523	0.539	0.539	0.526	0.547
21	0.554	0.554	0.589	0.559	0.576
31	0.567	0.58	0.613	0.578	0.613
60	0.557	0.562	0.59	0.577	0.591
90	0.546	0.564	0.589	0.563	0.574
125	0.564	0.563	0.597	0.556	0.586
151	0.536	0.551	0.592	0.581	0.589

SUBJECT # 106 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.538	0.568	0.517	0.534	0.554
1	0.525	0.553	0.527	0.563	0.55
4	0.54	0.576	0.554	0.57	0.565
7	0.544	0.564	0.545	0.578	0.578
14	0.535	0.564	0.561	0.574	0.582
21	0.551	0.556	0.544	0.581	0.575
28	0.554	0.556	0.557	0.574	0.583
61	0.552	0.579	0.588	0.602	0.596

COMPLETED DAY 61 ONLY

SUBJECT # 106 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.519	0.551	0.54	0.52	0.55
1	0.521	0.536	0.53	0.51	0.533
4	0.546	0.538	0.561	0.551	0.564
7	0.542	0.564	0.56	0.533	0.55
14	0.524	0.55	0.575	0.549	0.566
21	0.547	0.558	0.57	0.552	0.572
28	0.547	0.57	0.569	0.559	0.582
61	0.578	0.579	0.594	0.597	0.61

COMPLETED DAY 61 ONLY

SUBJECT # 107 EYE: OD LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.562	0.577	0.581	0.589	0.594
1	0.56	0.596	0.599	0.606	0.614
4	0.604	0.612	0.615	0.629	0.646
7	0.529	0.561	0.555	0.586	0.577
14	0.548	0.577	0.547	0.571	0.557
22	0.557	0.557	0.537	0.554	0.552
29	0.537	0.556	0.551	0.56	0.542
60	0.564	0.585	0.565	0.582	0.591
88	0.565	0.586	0.568	0.575	0.588
120	0.533	0.551	0.544	0.558	0.548
150	0.579	0.617	0.599	0.604	0.593

SUBJECT # 107 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.542	0.58	0.561	0.556	0.593
1	0.585	0.607	0.62	0.582	0.601
4	0.619	0.62	0.618	0.608	0.621
7	0.54	0.573	0.565	0.554	0.553
14	0.543		0.555	0.547	0.558
22	0.539	0.528	0.553	0.549	0.563
29	0.549	0.563	0.559	0.526	0.553
60	0.559	0.572	0.586	0.566	0.593
88	0.56	0.563	0.564	0.548	0.555
120	0.543	0.554	0.565	0.548	0.555
150	0.593	0.598	0.6	0.589	0.596

SUBJECT # 108 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.545	0.559	0.553	0.562	0.573
1	0.589	0.574	0.595	0.603	0.605
4	0.588	0.605	0.629	0.611	0.618
7	0.579	0.602	0.605	0.61	0.61
13	0.611	0.619	0.647	0.642	0.647
20	0.6	0.606	0.625	0.623	0.62
33	0.617	0.648	0.645	0.654	0.637
61	0.589	0.606	0.614	0.624	0.611
90	0.571	0.596	0.595	0.585	0.614
121	0.534	0.549	0.557	0.555	0.583
149	0.59	0.607	0.601	0.605	0.615

SUBJECT # 108 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.538	0.574	0.563	0.564	0.571
1	0.571	0.592	0.58	0.568	0.595
4	0.578	0.593	0.608	0.6	0.619
7	0.581	0.613	0.593	0.595	0.605
13	0.602	0.609	0.615	0.609	0.62
20	0.6	0.613	0.612	0.628	0.634
33	0.603	0.634	0.632	0.643	0.641
61	0.606	0.619	0.621	0.624	0.617
90	0.565	0.587	0.597	0.587	0.59
121	0.548	0.572	0.566	0.552	0.568
149	0.6	0.613	0.605	0.583	0.624

SUBJECT # 109 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.568	0.58	0.591	0.591	0.581
1	0.522	0.536	0.531	0.552	0.569
4	0.53	0.57	0.56	0.596	0.581
7	0.522	0.57	0.556	0.586	0.575
14	0.528	0.552	0.542	0.55	0.557
21					
28	0.493	0.534	0.526	0.549	0.538
60	0.558	0.58	0.574	0.566	0.597
90	0.543	0.573	0.573	0.592	0.603
125	0.514	0.556	0.54	0.56	0.57
150	0.53	0.549	0.549	0.559	0.566

SUBJECT # 109 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.563	0.581	0.587	0.571	0.598
1	0.562	0.569	0.552	0.548	0.552
4	0.563	0.582	0.588	0.566	0.552
7	0.563	0.591	0.599	0.552	0.573
14	0.527	0.556	0.565	0.543	0.565
21					
28	0.521	0.533	0.532	0.521	0.534
60	0.596	0.588	0.601	0.59	0.572
90	0.584	0.569	0.589	0.569	0.604
125	0.551	0.568	0.568	0.557	0.572
150	0.529	0.556	0.554	0.548	0.547

SUBJECT # 110 EYE: OD LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.472	0.518	0.493	0.528	0.532
1	0.499	0.529	0.534	0.53	0.551
4	0.522	0.557	0.551	0.595	0.604
7	0.51	0.554	0.56	0.569	0.584
14	0.517	0.534	0.543	0.559	0.539
21	0.545	0.553	0.556	0.579	0.567
28	0.551	0.568	0.563	0.575	0.592
62	0.54	0.567	0.563	0.573	0.577
89	0.495	0.532	0.52	0.525	0.542

COMPLETED DAY 89 ONLY

SUBJECT # 110 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.498	0.509	0.493	0.507	0.52
1	0.525	0.547	0.555	0.545	0.539
4	0.559	0.551	0.552	0.556	0.573
7	0.543	0.579	0.566	0.55	0.573
14	0.544	0.55	0.535	0.536	0.538
21	0.553	0.573	0.574	0.548	0.573
28	0.557	0.575	0.59	0.556	0.583
62	0.561	0.576	0.59	0.561	0.565
89	0.504	0.529	0.541	0.518	0.541

COMPLETED DAY 89 ONLY

SUBJECT # 111 EYE: OD LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.512	0.542	0.521	0.546	0.566
1	0.536	0.554	0.557	0.6	0.587
4	0.555	0.583	0.584	0.611	0.604
7	0.546	0.579	0.57	0.589	0.605
13	0.597	0.634	0.603	0.648	0.65
21	0.588	0.609	0.609	0.623	0.639
28	0.57	0.594	0.571	0.593	0.609
61	0.576	0.611	0.588	0.613	0.619
90	0.555	0.562	0.563	0.554	0.565
124	0.577	0.589	0.61	0.619	0.606
158	0.533	0.545	0.54	0.554	0.556

SUBJECT # 111 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.522	0.532	0.535	0.541	0.551
1	0.553	0.563	0.579	0.561	0.572
4	0.565	0.594	0.607	0.575	0.604
7	0.574	0.593	0.609	0.585	0.603
13	0.615	0.648	0.657	0.638	0.651
21	0.593	0.622	0.628	0.614	0.64
28	0.59	0.606	0.616	0.597	0.609
61	0.604	0.604	0.638	0.617	0.639
90	0.56	0.586	0.584	0.571	0.59
124	0.599	0.604	0.605	0.596	0.61
158	0.533	0.542	0.559	0.559	0.547

SUBJECT # 112 EYE: OD LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.613	0.621	0.615	0.637	0.62
1	0.578	0.608	0.595	0.615	0.635
4	0.637	0.675	0.668	0.684	0.706
8	0.585	0.638	0.609	0.645	0.654
14	0.572	0.592	0.59	0.593	0.6
21	0.588	0.604	0.597	0.61	0.617
28	0.603	0.631	0.638	0.639	0.651
61	0.583	0.602	0.601	0.61	0.598
90	0.561	0.575	0.583	0.582	0.591
123	0.559	0.589	0.603	0.586	0.605
151	0.577	0.595	0.61	0.617	0.619

SUBJECT # 112 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.596	0.633	0.621	0.606	0.627
1	0.607	0.62	0.615	0.614	0.606
4	0.657	0.683	0.706	0.678	0.688
8	0.613	0.636	0.63	0.629	0.629
14	0.58	0.599	0.61	0.593	0.594
21	0.599	0.602	0.62	0.604	0.612
28	0.629	0.634	0.653	0.636	0.657
61	0.602	0.61	0.626	0.627	0.621
90	0.558	0.589	0.61	0.583	0.607
123	0.586	0.619	0.608	0.603	0.62
151	0.588	0.609	0.612	0.597	0.624

SUBJECT # 113 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.468	0.487	0.502	0.505	0.514
1	0.521	0.537	0.551	0.541	0.548
4					
7	0.511	0.514	0.528	0.551	0.547
14	0.517	0.509	0.515	0.52	0.513
21	0.482	0.516	0.513	0.512	0.509
29	0.511	0.527	0.518	0.534	0.534
60	0.56	0.557	0.554	0.574	0.572
90	0.542	0.566	0.548	0.558	0.555
118	0.504	0.525	0.54	0.543	0.53
151	0.505	0.52	0.53	0.526	0.525

SUBJECT # 113 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.507	0.495	0.515	0.501	0.534
1	0.525	0.528	0.546	0.536	0.553
4					
7	0.524	0.54	0.551	0.536	0.549
14	0.506	0.533	0.532	0.51	0.53
21	0.471	0.478	0.482	0.483	0.492
29	0.511	0.529	0.532	0.541	0.537
60	0.56	0.573	0.563	0.567	0.569
90	0.545	0.549	0.563	0.556	0.56
118	0.535	0.536	0.546	0.527	0.552
151	0.506	0.524	0.535	0.502	0.524

SUBJECT # 114 EYE: OD LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.565	0.575	0.554	0.591	0.587
1	0.546	0.584	0.575	0.596	0.605
4	0.6	0.601	0.602	0.622	0.631
7	0.582	0.61	0.61	0.617	0.634
14	0.612	0.619	0.61	0.654	0.631
21	0.59	0.606	0.598	0.617	0.632
28	0.564	0.569	0.581	0.589	0.608

DROPPED - DUE TO PREGNANCY - DAY 28

SUBJECT # 114 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.561	0.572	0.591	0.584	0.576
1	0.584	0.59	0.601	0.589	0.602
4	0.597	0.602	0.633	0.618	0.621
7	0.606	0.605	0.626	0.605	0.634
14	0.603	0.625	0.627	0.611	0.629
21	0.601	0.608	0.634	0.612	0.631
28	0.582	0.593	0.615	0.579	0.607

DROPPED - DUE TO PREGNANCY - DAY 28

SUBJECT # 115 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.461	0.487	0.482	0.498	0.511
1	0.446	0.487	0.482	0.512	0.498
4	0.47	0.495	0.503	0.519	0.529
7	0.504	0.496	0.487	0.501	0.52
14	0.452	0.459	0.467	0.497	0.484
21	0.437	0.491	0.491	0.506	0.507
28	0.479	0.51	0.489	0.519	0.508
58	0.476	0.501	0.508	0.515	0.541
86	0.502	0.527	0.518	0.519	0.54
120	0.488	0.512	0.506	0.523	0.525
150	0.483	0.503	0.481	0.5	0.519

SUBJECT # 115 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.494	0.522	0.523	0.504	0.525
1	0.501	0.484	0.516	0.504	0.533
4	0.498	0.533	0.549	0.519	0.53
7	0.506	0.521	0.529	0.518	0.53
14	0.494	0.497	0.519	0.515	0.524
21	0.484	0.504	0.533	0.501	0.522
28	0.499	0.526	0.52	0.514	0.516
58	0.569	0.527	0.549	0.512	0.549
86	0.524	0.536	0.541	0.524	0.534
120	0.496	0.52	0.539	0.501	0.541
150	0.505	0.512	0.504	0.492	0.508

SUBJECT # 116 EYE: OD LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:

DROPPED - INABILITY TO WEAR EW

SUBJECT # 116 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:

DROPPED - INABILITY TO WEAR EW

SUBJECT # 117 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.536	0.571	0.551	0.589	0.588
1	0.544	0.606	0.577	0.593	0.586
4	0.574	0.608	0.591	0.623	0.635
7	0.559	0.581	0.588	0.576	0.607
14	0.555	0.59	0.562	0.593	0.577
21	0.544	0.571	0.543	0.586	0.578
28	0.539	0.586	0.553	0.573	0.566
60	0.52	0.558	0.549	0.552	0.568
88	0.54	0.561	0.557	0.566	0.552

COMPLETED DAY 88 ONLY

SUBJECT # 117 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.561	0.573	0.584	0.541	0.573
1	0.568	0.595	0.593	0.582	0.615
4	0.581	0.618	0.63	0.6	0.621
7	0.569	0.601	0.605	0.564	0.606
14	0.559	0.578	0.587	0.57	0.575
21	0.553	0.568	0.596	0.55	0.569
28	0.546	0.572	0.607	0.558	0.575
60	0.541	0.563	0.576	0.537	0.55
88	0.521	0.565	0.576	0.535	0.557

COMPLETED DAY 88 ONLY

SUBJECT # 118 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.549	0.556	0.557	0.573	0.582
1	0.554	0.586	0.564	0.588	0.615
3	0.541	0.601	0.583	0.612	0.621
7	0.558	0.579	0.561	0.596	0.59
14	0.553	0.617	0.573	0.623	0.6
21	0.574	0.614	0.596	0.638	0.62
28	0.579	0.622	0.586	0.615	0.622
62	0.62	0.639	0.606	0.622	0.648
91	0.561	0.585	0.583	0.602	0.603
126	0.554	0.591	0.561	0.602	0.586
150	0.573	0.595	0.586	0.604	0.614

SUBJECT # 118 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.538	0.543	0.553	0.537	0.557
1	0.58	0.58	0.62	0.576	0.594
3	0.574	0.586	0.621	0.571	0.606
7	0.563	0.583	0.602	0.555	0.581
14	0.576	0.606	0.636	0.567	0.602
21	0.599	0.619	0.637	0.587	0.631
28	0.609	0.622	0.63	0.593	0.615
62	0.602	0.627	0.626	0.591	0.625
91	0.555	0.585	0.587	0.572	0.577
126	0.551	0.58	0.587	0.549	0.606
150	0.58	0.615	0.626	0.598	0.607

SUBJECT # 119 EYE: OD LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.566	0.601	0.56	0.571	0.607
1	0.55	0.597	0.573	0.574	0.627
4	0.525	0.586	0.553	0.573	0.595
7	0.552	0.565	0.563	0.591	0.583
14	0.515	0.564	0.565	0.575	0.584
21		0.544	0.501	0.527	0.535
28	0.544	0.548	0.551	0.559	0.572
60	0.539	0.556	0.554	0.567	0.566
90	0.554	0.592	0.575	0.574	0.575
118	0.602	0.624	0.622	0.643	0.641
151	0.518	0.539	0.528	0.535	0.565

SUBJECT # 119 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.559	0.578	0.614	0.558	0.581
1	0.567	0.576	0.623	0.577	0.627
4	0.551	0.568	0.583	0.551	0.595
7	0.56	0.586	0.599	0.559	0.605
14	0.554	0.571	0.577	0.569	0.572
21	0.496		0.521	0.52	0.537
28	0.541	0.567	0.574	0.561	0.577
60	0.548	0.564	0.582	0.566	0.591
90	0.575	0.584	0.6	0.567	0.603
118	0.616	0.633	0.645	0.63	0.634
151	0.539	0.541	0.554	0.53	0.547

SUBJECT # 120 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.57	0.585	0.564	0.604	0.587
1	0.516	0.541	0.533	0.597	0.579
4	0.524	0.554	0.526	0.575	0.565
7	0.532	0.538	0.523	0.56	0.555
14	0.544	0.546	0.54	0.578	0.539
21	0.542	0.571	0.538	0.581	0.585
28	0.527	0.545	0.535	0.586	0.565
59	0.542	0.552	0.547	0.571	0.56
88	0.522	0.521	0.539	0.557	0.558
118	0.525	0.557	0.55	0.556	0.567
146	0.523	0.547	0.545	0.548	0.554

SUBJECT # 120 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.57	0.6	0.614	0.57	0.596
1	0.524	0.523	0.564	0.516	0.533
4	0.55	0.539	0.558	0.517	0.555
7	0.512	0.516	0.571	0.529	0.538
14	0.534	0.537	0.552	0.524	0.546
21	0.547	0.565	0.6	0.536	0.569
28	0.552	0.547	0.579	0.511	0.565
59	0.552	0.541	0.554	0.537	0.567
88	0.531	0.565	0.592	0.551	0.571
118	0.523	0.553	0.571	0.549	0.568
146	0.542	0.555	0.567	0.519	0.551

SUBJECT # 121 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.556	0.546	0.549	0.575	0.575
1	0.545	0.583	0.57	0.589	0.596
4	0.534	0.538	0.545	0.587	0.598
7	0.516	0.521	0.524	0.578	0.545
14	0.525	0.547	0.513	0.553	0.587
21	0.515	0.533	0.539	0.547	0.559
28	0.545	0.552	0.558	0.562	0.591
60	0.54	0.552	0.557	0.563	0.6
87	0.551	0.562	0.561	0.591	0.597
122	0.491	0.505	0.515	0.537	0.518
150	0.54	0.556	0.551	0.572	0.589

SUBJECT # 121 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.551	0.557	0.564	0.55	0.588
1	0.552	0.586	0.563	0.58	0.63
4	0.551	0.56	0.588	0.563	0.598
7	0.526	0.523	0.54	0.527	0.55
14	0.543	0.553	0.553	0.543	0.571
21	0.53	0.54	0.557	0.538	0.565
28	0.547	0.552	0.566	0.563	0.584
60	0.55	0.547	0.579	0.562	0.601
87	0.561	0.557	0.567	0.562	0.594
122	0.504	0.501	0.524	0.519	0.52
150	0.561	0.544	0.561	0.562	0.558

SUBJECT # 122 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.581	0.603	0.614	0.628	0.628
1	0.579	0.604	0.592	0.627	0.652
4	0.569	0.619	0.598	0.62	0.643
7	0.559	0.596	0.598	0.606	0.614
14	0.616	0.65	0.641	0.661	0.672
22	0.61	0.652	0.62	0.636	0.651
28	0.596	0.629	0.612	0.647	0.665
62	0.623	0.656	0.65	0.668	0.674
88	0.616	0.648	0.647	0.65	0.654
120	0.614	0.631	0.646	0.656	0.637
142	0.579	0.628	0.604	0.621	0.642

SUBJECT # 122 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.584	0.588	0.617	0.595	0.607
1	0.595	0.612	0.631	0.6	0.611
4	0.592	0.617	0.612	0.59	0.605
7	0.595	0.6	0.608	0.572	0.608
14	0.651	0.652	0.666	0.651	0.673
22	0.623	0.645	0.666	0.627	0.652
28	0.621	0.632	0.644	0.613	0.651
62	0.639	0.658	0.67	0.656	0.673
88	0.629	0.648	0.659	0.645	0.659
120	0.628	0.655	0.659	0.634	0.647
142	0.604	0.621	0.65	0.608	0.637

SUBJECT # 123 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.484	0.531	0.502	0.53	0.52
1	0.495	0.539	0.514	0.531	0.545
4	0.486	0.526	0.508	0.538	0.564
7	0.507	0.549	0.523	0.539	0.563
15	0.499	0.532	0.513	0.54	0.555
22	0.514	0.536	0.539	0.578	0.573
29	0.504	0.55	0.521	0.521	0.547
60	0.509	0.532	0.522	0.529	0.546
92	0.525	0.55	0.523	0.522	0.546
120	0.482	0.513	0.507	0.511	0.508
150	0.507	0.529	0.515	0.537	0.521

SUBJECT # 123 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.48	0.511	0.531	0.506	0.515
1	0.499	0.526	0.533	0.48	0.515
4	0.501	0.52	0.523	0.495	0.519
7	0.496	0.531	0.55	0.505	0.535
15	0.522	0.545	0.563	0.511	0.547
22	0.556	0.552	0.573	0.539	0.573
29	0.52	0.519	0.546	0.506	0.526
60	0.524	0.539	0.552	0.522	0.551
92	0.516	0.521	0.546	0.518	0.542
120	0.478	0.506	0.513	0.474	0.485
150	0.489	0.515	0.528	0.482	0.535

SUBJECT # 124 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.567	0.612	0.622	0.614	0.634
1	0.561	0.622	0.596	0.585	0.602
4	0.553	0.569	0.559	0.579	0.569
7	0.537	0.565	0.548	0.56	0.542
14	0.578	0.598	0.58	0.595	0.599
21	0.558	0.557	0.558	0.565	0.569
28	0.554	0.569	0.588	0.586	0.591
59	0.573	0.586	0.582	0.592	0.597

COMPLETED DAY 59 ONLY

SUBJECT # 124 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.595	0.606	0.604	0.62	0.622
1	0.571	0.576	0.593	0.581	0.585
4	0.57	0.56	0.558	0.563	0.559
7	0.559	0.545	0.552	0.566	0.567
14	0.566	0.591	0.586	0.574	0.612
21	0.539	0.549	0.561	0.552	0.57
28	0.569	0.581	0.595	0.59	0.59
59	0.588	0.583	0.588	0.598	0.593

COMPLETED DAY 59 ONLY

SUBJECT # 125 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.531	0.533	0.526	0.536	0.552
1	0.484	0.524	0.49	0.527	0.52
3	0.48	0.509	0.523	0.523	0.532
7	0.504	0.541	0.522	0.546	0.553
14	0.484	0.514	0.507	0.522	0.546
21	0.516	0.535	0.524	0.544	0.543
28	0.57	0.595	0.575	0.587	0.604
61	0.517	0.552	0.543	0.561	0.558

COMPLETED DAY 61 ONLY

SUBJECT # 125 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.537	0.555	0.551	0.529	0.583
1	0.521	0.496	0.516	0.509	0.513
3	0.522	0.55	0.566	0.509	0.544
7	0.539	0.553	0.576	0.535	0.568
14	0.51	0.506	0.526	0.508	0.53
21	0.537	0.555	0.551	0.525	0.55
28	0.563	0.581	0.609	0.569	0.584
61	0.577	0.555	0.567	0.55	0.57

COMPLETED DAY 61 ONLY

SUBJECT # 126 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.495	0.499	0.479	0.506	0.52
1	0.518	0.529	0.513	0.54	0.512
4	0.48	0.517	0.502	0.511	0.519
8	0.511	0.547	0.522	0.559	0.539
14	0.502	0.514	0.495	0.518	0.517
21	0.497	0.519	0.507	0.527	0.523
28	0.492	0.518	0.502	0.528	0.509
59	0.514	0.553	0.528	0.553	0.551
91	0.524	0.566	0.542	0.563	0.541
115	0.483	0.541	0.503	0.526	0.552
154	0.503	0.546	0.507	0.532	0.522

SUBJECT # 126 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.469	0.498	0.519	0.481	0.5092
1	0.528	0.529	0.547	0.535	0.551
4	0.497	0.501	0.523	0.502	0.515
8	0.511	0.521	0.536	0.533	0.541
14	0.514	0.512	0.524	0.524	0.527
21	0.517	0.51	0.523	0.489	0.509
28	0.494	0.521	0.533	0.501	0.506
59	0.521	0.538	0.554	0.536	0.552
91	0.533	0.569	0.582	0.548	0.581
115	0.518	0.53	0.541	0.506	0.541
154	0.521	0.539	0.551	0.524	0.547

SUBJECT # 127 EYE: OD LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:

DROPPED FROM STUDY DUE TO PREGNANCY

SUBJECT # 127 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:

DROPPED FROM STUDY DUE TO PREGNANCY

SUBJECT # 128 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:

DROPPED - UNABLE TO CONFORM TO GUIDELINES OF STUDY

SUBJECT # 128 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:

DROPPED - UNABLE TO CONFORM TO GUIDELINES OF STUDY

SUBJECT # 129 EYE: OD LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.52	0.541	0.525	0.537	0.54
1	0.502	0.538	0.541	0.562	0.558
4	0.538	0.541	0.544	0.553	0.568
7	0.55	0.571	0.551	0.566	0.568
14	0.536	0.563	0.547	0.571	0.578
21	0.566	0.592	0.573	0.605	0.606
28	0.546	0.574	0.572	0.604	0.59
62	0.511	0.532	0.517	0.545	0.551
90	0.52	0.542	0.543	0.549	0.549
120	0.527	0.553	0.549	0.551	0.561
147	0.519	0.53	0.522	0.535	0.535

SUBJECT # 129 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.505	0.537	0.536	0.517	0.525
1	0.534	0.543	0.557	0.538	0.551
4	0.514	0.552	0.561	0.555	0.556
7	0.546	0.574	0.572	0.569	0.569
14	0.53	0.555	0.573	0.537	0.573
21	0.559	0.57	0.593	0.583	0.6
28	0.562	0.561	0.58	0.589	0.591
62	0.515	0.524	0.55	0.529	0.548
90	0.528	0.54	0.563	0.539	0.548
120	0.533	0.549	0.555	0.547	0.568
147	0.52	0.515	0.552	0.517	0.554

SUBJECT # 130 EYE: OD LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.544	0.494	0.548	0.575	0.563
1	0.513	0.514	0.548	0.554	0.59
4	0.534	0.534	0.566	0.588	0.574
7	0.54	0.564	0.579	0.585	0.598
14	0.49	0.496	0.517	0.545	0.55
21	0.462	0.49	0.503	0.508	0.532
29	0.521	0.524	0.535	0.548	0.535
60	0.547	0.554	0.568	0.586	0.586
88	0.556	0.574	0.584	0.608	0.58
118	0.527	0.545	0.544	0.558	0.545
151	0.498	0.5	0.534	0.531	0.524

SUBJECT # 130 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.526	0.584	0.591	0.558	0.585
1	0.513	0.54	0.576	0.569	0.554
4	0.542	0.566	0.57	0.592	0.589
7	0.541	0.564	0.56	0.567	0.571
14	0.513	0.508	0.53	0.509	0.52
21	0.497	0.471	0.5	0.503	0.53
29	0.509	0.512	0.547	0.546	0.564
60	0.564	0.564	0.581	0.579	0.573
88	0.576	0.585	0.593	0.592	0.575
118	0.521	0.552	0.558	0.527	0.56
151	0.515	0.522	0.552	0.523	0.545

SUBJECT # 131 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.52	0.525	0.529	0.545	0.533
1	0.576	0.604	0.585	0.603	0.589
4	0.61	0.633	0.609	0.626	0.616
7	0.597	0.622	0.623	0.619	0.631

DROPPED - UNABLE TO WEAR EW

SUBJECT # 131 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.529	0.524	0.544	0.515	0.545
1	0.571	0.581	0.578	0.562	0.585
4	0.576	0.585	0.582	0.586	0.589
7	0.565	0.573	0.581	0.576	0.589

DROPPED - UNABLE TO WEAR EW

SUBJECT # 132 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.544	0.574	0.576	0.58	0.583
1	0.556	0.593	0.607	0.608	0.61
4	0.577	0.597	0.59	0.603	0.593
7	0.561	0.567	0.572	0.585	0.571
14	0.587	0.621	0.58	0.604	0.595
21	0.57	0.607	0.599	0.616	0.609
28	0.579	0.603	0.58	0.591	0.593
60	0.532	0.56	0.561	0.548	0.549
90	0.569	0.605	0.593	0.611	0.593
118	0.569		0.577	0.608	0.568
147	0.553	0.589	0.575	0.579	0.584

SUBJECT # 132 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.532	0.568	0.576	0.567	0.58
1	0.586	0.596	0.599	0.596	0.605
4	0.567	0.591	0.6	0.576	0.57
7	0.565	0.575	0.591	0.564	0.574
14	0.574	0.592	0.619	0.572	0.589
21	0.597	0.61	0.615	0.605	0.594
28	0.594	0.59	0.61	0.594	0.595
60	0.542	0.554	0.565	0.554	0.529
90	0.563	0.594	0.611	0.59	0.58
118	0.547	0.556	0.585	0.58	0.578
147	0.557	0.569	0.594	0.566	0.568

SUBJECT # 133 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.537	0.555	0.575	0.598	0.571
1	0.519	0.562	0.548	0.583	0.601
4	0.538	0.547	0.521	0.571	0.571
7					
14	0.535	0.573	0.561	0.599	0.578
21	0.532	0.568	0.524	0.569	0.547
27	0.53	0.56	0.562	0.587	0.576
60	0.535	0.565	0.564	0.57	0.593
94	0.5	0.546	0.547	0.548	0.553
118	0.483	0.514	0.51	0.526	0.531
147	0.531	0.554	0.545	0.578	0.567

SUBJECT # 133 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.548	0.561	0.571	0.541	0.59
1		0.543			
4	0.523	0.548	0.539	0.555	0.56
7					
14	0.544	0.571	0.564	0.559	0.576
21	0.54	0.544	0.543	0.532	0.528
27	0.541	0.586	0.564	0.561	0.556
60	0.553	0.582	0.577	0.555	0.591
94	0.53	0.548	0.545	0.531	0.576
118	0.515	0.54	0.533	0.527	0.54
147	0.535	0.558	0.569	0.534	0.567

SUBJECT # 134 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.465	0.495	0.491	0.519	0.502
1	0.472	0.502	0.455	0.506	0.497
4	0.469	0.524	0.516	0.547	0.55
7	0.468	0.493	0.476	0.515	0.503
14	0.581	0.623	0.619	0.594	0.565
21	0.492	0.527	0.491	0.518	0.523
28	0.482	0.514	0.494	0.53	0.539
60	0.494	0.535	0.522	0.53	0.534
102	0.462	0.501	0.496	0.527	0.506
123	0.474	0.508	0.493	0.508	0.494
145	0.477	0.49	0.489	0.486	0.489

SUBJECT # 134 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.464	0.499	0.503	0.465	0.5
1	0.458	0.489	0.511	0.471	0.496
4	0.49	0.527	0.559	0.5	0.533
7	0.467	0.519	0.518	0.489	0.517
14	0.558	0.592	0.628	0.582	0.598
21	0.5	0.504	0.519	0.504	0.516
28	0.494	0.513	0.518	0.511	0.515
60	0.512	0.517	0.536	0.504	0.527
102	0.471	0.507	0.517	0.478	0.495
123	0.469	0.503	0.509	0.477	0.505
145	0.465	0.496	0.507	0.47	0.511

SUBJECT # 135 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.493	0.543	0.551	0.537	0.547
1	0.526	0.577	0.56	0.575	0.587
4	0.522	0.543	0.53	0.548	0.544
7	0.515	0.552	0.561	0.53	0.573
14	0.476	0.513	0.502	0.521	0.534
21	0.527	0.543	0.554	0.555	0.579
28	0.572	0.568	0.552	0.592	0.611
60	0.559	0.599	0.584	0.62	0.625
90	0.561	0.577	0.576	0.591	0.6
120	0.52	0.535	0.548	0.537	0.56
151	0.525	0.543	0.555	0.563	0.562

SUBJECT # 135 EYE: OS LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.518	0.536	0.564	0.535	0.565
1	0.539	0.583	0.599	0.551	0.611
4	0.526	0.54	0.537	0.534	0.565
7	0.545	0.543	0.567	0.546	0.572
14	0.5	0.5	0.511	0.496	0.53
21	0.526	0.55	0.567	0.55	0.576
28	0.572	0.596	0.604	0.575	0.613
60	0.58	0.56	0.595	0.588	0.598
90	0.566	0.574	0.587	0.576	0.594
120	0.527	0.529	0.566	0.546	0.568
151	0.513	0.525	0.555	0.521	0.551

SUBJECT # 136 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.561	0.59	0.586	0.584	0.601
1	0.528	0.535	0.523	0.532	0.559
4	0.527	0.573	0.55	0.602	0.588
8	0.527	0.538	0.549	0.589	0.562
14	0.551	0.561	0.546	0.583	0.576
21					
28	0.542	0.553	0.563	0.597	0.583
61	0.566	0.587	0.57	0.581	0.587
89	0.533	0.564	0.551	0.559	0.56
121	0.539	0.554	0.547	0.568	0.584
149	0.566	0.576	0.567	0.582	0.579

SUBJECT # 136 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.569	0.59	0.61	0.575	0.611
1	0.517	0.554	0.568	0.533	0.552
4	0.528	0.555	0.562	0.554	0.572
8	0.537	0.558	0.578	0.532	0.556
14	0.544	0.562	0.58	0.541	0.569
21					
28	0.547	0.553	0.588	0.558	0.571
61	0.548	0.588	0.607	0.557	0.599
89	0.542	0.558	0.574	0.552	0.568
121	0.527	0.556	0.565	0.539	0.56
149	0.547	0.566	0.586	0.558	0.581

SUBJECT # 137 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.465	0.544	0.512	0.512	0.498
1	0.449	0.505	0.493	0.515	0.518
4	0.507	0.54	0.537	0.563	0.56
7	0.458	0.507	0.494	0.533	0.494
14					
21	0.444	0.473	0.488	0.49	0.476
28	0.45	0.501	0.483	0.504	0.494
61	0.513	0.544	0.529	0.562	0.547
91	0.484	0.505	0.503	0.53	0.523
119	0.486	0.516	0.485	0.52	0.492
149	0.507	0.537	0.517	0.523	0.53

SUBJECT # 137 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.485	0.52	0.51	0.49	0.494
1	0.52	0.55	0.568	0.539	0.55
4	0.567	0.587	0.58	0.553	0.534
7	0.508	0.51	0.542	0.515	0.539
14					
21	0.493	0.514	0.525	0.502	0.513
28	0.474	0.491	0.507	0.458	0.499
61	0.53	0.544	0.563	0.529	0.529
91	0.496	0.519	0.537	0.491	0.506
119	0.48	0.497	0.537	0.496	0.527
149	0.513	0.53	0.543	0.5	0.54

SUBJECT # 138 EYE: OD LENS TYPE PF

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.524	0.572	0.547	0.583	0.578
1	0.557	0.57	0.555	0.569	0.574
4	0.544	0.568	0.551	0.576	0.57
6	0.565	0.582	0.559	0.582	0.582
13	0.591	0.614	0.608	0.645	0.637
20	0.587	0.598	0.587	0.603	0.599
27	0.605	0.624	0.591	0.632	0.624
60	0.564	0.59	0.559	0.574	0.583

COMPLETED DAY 60 ONLY

SUBJECT # 138 EYE: OS LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.549	0.573	0.537	0.55	0.55
1	0.55	0.582	0.587	0.562	0.57
4	0.559	0.581	0.596	0.554	0.574
6	0.564	0.605	0.604	0.576	0.574
13	0.608	0.655	0.625	0.619	0.628
20	0.579	0.6	0.602	0.612	0.593
27	0.595	0.616	0.616	0.595	0.609
60	0.573	0.587	0.593	0.57	0.588

COMPLETED DAY 60 ONLY

SUBJECT # 139 EYE: OD LENS TYPE HC II

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.483	0.513	0.507	0.525	0.511
1	0.516	0.528	0.517	0.549	0.56
4	0.504	0.539	0.498	0.541	0.542
7					
14	0.473	0.534	0.499	0.538	0.529
21	0.512	0.53	0.507	0.537	0.534
28	0.523	0.543	0.532	0.56	0.556
59	0.525	0.54	0.521	0.548	0.548
87	0.52	0.539	0.524	0.54	0.532
120	0.503	0.54	0.53	0.548	0.545
151	0.464	0.483	0.483	0.508	0.513

SUBJECT # 139 EYE: OS LENS TYPE CSI-T

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.476	0.507	0.518	0.505	0.512
1	0.506	0.563	0.539	0.519	0.529
4	0.509	0.525	0.536	0.503	0.522
7					
14	0.491		0.54		0.523
21	0.509	0.527	0.544	0.522	0.532
28	0.54	0.556	0.556	0.516	0.54
59	0.511	0.524	0.553	0.525	0.546
87	0.512	0.531	0.539	0.512	0.54
120	0.505	0.542	0.554	0.51	0.53
151	0.462	0.479	0.514	0.453	0.5

PATIENT NO: 301 EYE: OD

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.488	0.5	0.486	0.493	0.51
14	0.481	0.507	0.499	0.519	0.538
30	0.458	0.488	0.486	0.508	0.518
60	0.465	0.489	0.488	0.506	0.525
90	0.47	0.49	0.478	0.508	0.522
120	0.482	0.484	0.49	0.495	0.508

PATIENT NO: 301 EYE: OS

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.488	0.508	0.528	0.493	0.512
14	0.494	0.492	0.534	0.519	0.546
30	0.489	0.488	0.523	0.488	0.525
60	0.504	0.509	0.524	0.497	0.521
90	0.488	0.485	0.524	0.493	0.524
120	0.463	0.489	0.528	0.468	0.511

PATIENT NO: 303 EYE: OD

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.497	0.524	0.489	0.543	0.512
14	0.496	0.524	0.48	0.537	0.531
28	0.507	0.536	0.506	0.544	0.515
60	0.487	0.521	0.515	0.543	0.539
90	0.451	0.487	0.467	0.515	0.475
120	0.488	0.509	0.493	0.521	0.494

PATIENT NO: 303 EYE: OS

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.508	0.534	0.522	0.512	0.515
14	0.51	0.542	0.56	0.509	0.528
28	0.509	0.528	0.534	0.523	0.533
60	0.51	0.544	0.531	0.53	0.516
90	0.46	0.49	0.497	0.469	0.502
120	0.498	0.523	0.524	0.501	0.511

PATIENT NO: 304 **EYE:** OD

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.542	0.568	0.546	0.571	0.57
14	0.539	0.565	0.566	0.571	0.575
30	0.552	0.575	0.561	0.56	0.57
60	0.491	0.532	0.522	0.53	0.532
90	0.52	0.564	0.547	0.559	0.558
120	0.536	0.571	0.554	0.554	0.56

PATIENT NO: 304 **EYE:** OS

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.547	0.57	0.549	0.558	0.568
14	0.563	0.581	0.592	0.554	0.576
30	0.562	0.59	0.562	0.575	0.57
60	0.527	0.536	0.533	0.533	0.545
90	0.559	0.548	0.568	0.555	0.554
120	0.55	0.568	0.576	0.535	0.558

PATIENT NO: 305 **EYE:** OD

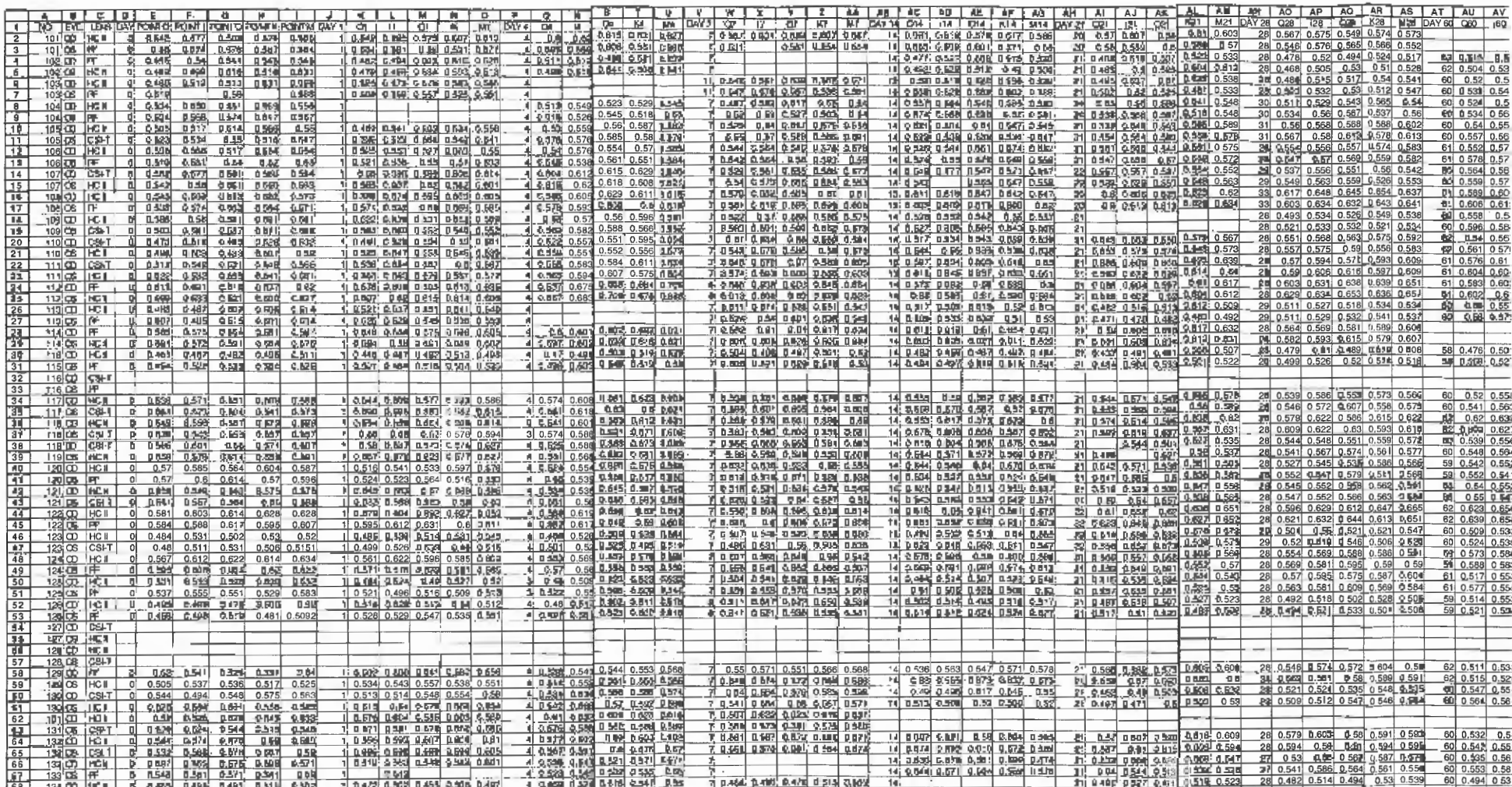
DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.558	0.589	0.551	0.572	0.564
14	0.53	0.566	0.543	0.572	0.558
30					
60	0.516	0.546	0.542	0.564	0.551
90	0.512	0.552	0.533	0.565	0.577
120	0.522	0.569	0.546	0.563	0.569

PATIENT NO: 305 **EYE:** OS

DAY:	POINT Q:	POINT I:	POINT O:	POINT K:	POINT M:
0	0.557	0.584	0.594	0.571	0.599
14	0.55	0.567	0.574	0.544	0.575
30					
60	0.541	0.549	0.577	0.54	0.558
90	0.54	0.567	0.562	0.543	0.566
120	0.533	0.574	0.591	0.544	0.571

APPENDIX G

PACHOMETRY SPREADSHEET, THICKNESS AND PERCENTAGE CHANGES



AW	AX	AY	AZ	BA	BB	BC	BD
O60	K60	M60	DAY 90	Q90	i90	O90	K90
.548	0.542	0.555	91	0.51	0.567	0.557	0.557
.561	0.534	0.545	91	0.523	0.568	0.568	0.548
.518	0.552	0.554	110	0.517	0.534	0.534	0.555
.573	0.512	0.571	110	0.531	0.552	0.567	0.512
.558	0.568	0.561	90	0.502	0.543	0.528	0.541
.567	0.545	0.56	90	0.517	0.535	0.546	0.528
0.55	0.565	0.597	90	[illegible]	0.56	0.561	0.586
0.59	0.577	0.591	90	0.546	0.564	0.589	0.563
.588	0.602	0.596					
.594	0.597	0.61					
.565	0.582	0.591	88	0.565	0.586	0.568	0.575
.586	0.566	0.593	88	0.56	0.563	0.564	0.548
.614	0.624	0.611	90	0.571	0.596	0.595	0.585
.621	0.624	0.617	90	0.565	0.587	0.597	0.587
.574	0.566	0.597	90	0.543	0.573	0.573	0.592
.601	0.59	0.572	90	0.584	0.569	0.589	0.569
.563	0.573	0.577	89	0.495	0.532	0.52	0.525
0.59	0.561	0.565	89	0.504	0.529	0.541	0.518
.588	0.613	0.619	90	0.555	0.562	0.563	0.554
.638	0.617	0.639	90	[illegible]	0.586	0.584	0.571
.601	0.61	0.598	90	0.561	0.575	0.583	0.582
.626	0.627	0.621	90	0.558	0.589	0.61	0.583
.554	0.574	0.572	90	0.542	0.566	0.548	0.558
.563	0.567	0.569	90	0.545	0.549	0.563	0.556
.508	0.515	0.541	86	0.502	0.527	0.518	0.519
.549	0.512	0.549	86	0.524	0.536	0.541	0.524
.549	0.552	0.568	88	0.54	0.561	0.557	0.566
.576	0.537	0.55	88	0.521	0.565	0.576	0.535
.606	0.622	0.648	91	0.561	0.585	0.583	0.602
.626	0.591	0.625	91	0.555	0.585	0.587	0.572
.554	0.567	0.566	90	0.554	0.592	0.575	0.574
.582	0.566	0.591	90	0.575	0.584	0.6	0.567
.547	0.571	0.56	88	0.522	0.521	0.539	0.557
.554	0.537	0.567	88	0.531	0.565	0.592	0.551
.557	0.563	0.6	87	0.551	0.562	0.561	0.591
.579	0.562	0.601	87	0.561	0.557	0.567	0.562
0.65	0.668	0.674	88	0.616	0.648	0.647	0.65
0.67	0.656	0.673	88	0.629	0.648	0.659	0.645
.522	0.529	0.546	92	0.525	0.55	0.523	0.522
.552	0.522	0.551	92	0.516	0.521	0.546	0.518
.582	0.597	0.597					
.588	0.596	0.593					
.543	0.561	0.558					
.567	0.55	0.57					
.528	0.553	0.551	91	0.524	0.566	0.542	0.563
.554	0.53[illegible]	0.552	91	0.533	0.569	0.582	0.548
.517	0.545	0.551	90	0.52	0.542	0.543	0.549
0.55	0.529	0.548	90	0.528	0.54	0.563	0.539
.568	0.586	0.586	88	0.556	0.574	0.584	0.608
.581	0.579	0.573	88	0.576	0.585	0.593	0.592
.561	0.548	0.549	90	0.569	0.605	0.593	0.611
.565	0.554	0.529	90	0.563	0.594	0.611	0.59
.564	0.57	0.593	94	0.5	0.546	0.547	0.548
.577	0.555	0.591	94	0.53	0.548	0.545	0.531
.522	0.53	0.534	102	0.462	0.501	0.496	0.527
.536	0.504	0.527	102	0.471	0.507	0.517	0.478
.58[illegible]	0.62	0.625	90	0.561	0.577	0.576	0.591
.59[illegible]	0.588	0.598	90	[illegible]	0.574	0.587	0.576
0.57	0.581	0.587	89	0.533	0.564	0.551	0.559
.607	0.557	0.599	89	0.542	0.558	0.574	0.552
.52[illegible]	0.562	0.547	91	[illegible]	0.505	0.503	0.53
.56[illegible]	0.529	0.529	91	0.496	0.519	0.537	0.491
.55[illegible]	0.574	0.583					
.59[illegible]	0.57	0.588					
.521	0.548	0.548	87	0.52	0.539	0.524	0.54
.553	0.525	0.546	87	0.512	0.531	0.539	0.512
.571	0.568	0.579	90	0.538	0.561	0.564	0.558

BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS
M90	DAY 120	Q120	i120	O120	K120	M120	DAY 150	Q150	i150	O150	K150	M150	NOTES	
													JOINED ARMY - DROPPED	
													JOINED ARMY - DROPPED	
0.562	120	0.49	0.53	0.516	0.489	0.528	149	0.483	0.514	0.505	0.519	0.521		
0.56	120	0.461	0.499	0.507	0.478	0.505	149	0.495	0.527	0.521	0.495	0.532		
0.554	123	0.515	0.543	0.534	0.553	0.564	152	0.514	0.547	0.537	0.563	0.567		
0.558	123	0.523	0.518	0.56	0.528	0.554	152	0.535	0.562	0.58	0.532	0.555		
0.521	117	0.513	0.552	0.53	0.538	0.535								
0.542	117	0.541	0.545	0.545	0.518	0.541								
0.573	125	0.538	0.554	0.556	0.58	0.596	151	0.54	0.548	0.56	0.585	0.59		
0.574	125	0.564	0.563	0.597	0.556	0.586	151	0.536	0.551	0.592	0.581	[illegible]		
0.588	120	0.533	0.551	0.544	0.558	0.548	150	0.579	0.617	0.599	0.604	0.593		
0.555	120	0.543	0.554	0.565	0.548	0.555	150	0.593	0.598	0.6	0.589	0.596		
0.614	121	0.534	0.549	0.557	0.555	0.583	149	0.59	0.607	0.601	0.605	0.615		
0.59	121	0.548	0.572	0.566	0.552	0.568	149	0.6	0.613	0.605	0.583	0.624		
0.603	125	0.514	0.556	0.54	0.56	0.57	150	0.53	0.549	0.549	0.559	0.566		
0.604	125	0.551	0.568	0.568	0.557	0.572	150	0.529	0.556	0.554	0.548	0.547		
0.542														
0.541														
0.565	124	0.577	0.589	0.61	0.619	0.606	158	0.533	0.545	0.54	0.554	0.556		
0.59	124	0.599	0.604	0.605	0.596	0.61	158	0.533	0.542	0.559	0.559	0.547		
0.591	123	0.559	0.589	0.603	0.586	0.605	151	0.577	0.595	0.61	0.617	0.619		
0.607	123	0.586	0.619	0.608	0.603	0.62	151	0.588	0.609	0.612	0.597	0.624		
0.555	118	0.504	0.525	0.54	0.543	0.53	151	0.505	0.52	0.53	0.526	0.525		
0.56	118	0.535	0.536	0.546	0.527	0.552	151	0.506	0.524	0.535	0.502	0.524		
0.54	120	0.488	0.512	0.506	0.523	0.525	150	0.483	0.503	0.481	0.5	0.519		
0.534	120	0.496	0.52	0.539	0.501	0.541	150	0.505	0.512	0.504	0.492	0.508		
													DROPPED - INABILITY TO WEAR EW	
													DROPPED - INABILITY TO WEAR EW	
0.552														
0.557														
0.603	126	0.554	0.591	0.561	0.602	0.586	150	0.573	0.595	0.586	0.604	0.614		
0.577	126	0.551	0.58	0.587	0.549	0.606	[illegible]	0.58	0.615	0.626	0.598	0.607		
0.575	118	0.602	0.624	0.622	0.643	0.641	151	0.518	0.539	0.528	0.535	0.565		
0.603	118	0.616	0.633	0.645	0.63	0.634	151	0.539	0.541	0.554	0.53	0.547		
0.558	118	0.525	0.557	0.55	0.556	0.567	146	0.523	0.547	0.545	0.548	0.554		
0.571	118	0.523	0.553	0.571	0.549	0.568	146	0.542	0.555	0.567	0.519	0.551		
0.597	122	0.491	0.505	0.515	0.537	0.518	150	0.54	0.556	0.551	0.572	0.589		
0.594	122	0.504	0.501	0.524	0.519	0.52	150	0.561	0.544	0.561	0.562	[illegible]		
0.654	120	0.614	0.631	0.646	0.656	0.637	142	0.579	0.628	0.604	0.621	0.642		
0.659	120	0.628	0.655	0.659	0.634	0.647	142	0.604	0.621	0.65	0.608	0.637		
0.546	120	0.482	0.513	0.507	0.511	0.508	150	0.507	0.529	0.515	0.537	0.521		
0.542	120	0.478	0.506	0.513	0.474	0.485	150	0.489	0.515	0.528	0.482	0.535		
0.541	115	0.483	0.541	0.503	0.526	0.552	154	0.503	0.546	0.507	0.532	0.522		
0.581	115	0.518	0.53	0.541	0.506	0.541	154	0.521	0.539	0.551	0.524	0.547		
													DROPPED FROM STUDY	DUE TO PREGNANCY
													DROPPED FROM STUDY	DUE TO PREGNANCY
													DROPPED - UNABLE TO	CONFORM TO GUIDELINES OF STUDY
													DROPPED - UNABLE TO	CONFORM TO GUIDELINES OF STUDY
0.549	120	0.527	0.553	0.549	0.551	0.561	147	0.519	0.53	0.522	0.535	0.535		
0.548	120	0.533	0.549	0.555	0.547	0.568	147	0.52	0.515	0.552	0.517	0.554		
0.58	118	0.527	0.545	0.544	0.558	0.545	151	0.498	0.5	0.534	0.531	0.524		
0.575	118	0.521	0.552	0.558	0.527	0.56	151	0.515	0.522	0.552	0.523	0.545		
													DROPPED - UNABLE TO	WEAR EW
													DROPPED - UNABLE TO	WEAR EW
0.593	118	0.569		0.577	0.608	0.568	147	0.533	0.589	0.575	0.579	0.584		
0.58	118	0.547	0.556	0.585	0.58	0.578	147	0.557	0.569	0.594	0.566	0.568		
0.553	118	0.483	0.514	0.51	0.526	0.531	147	0.531	0.554	0.545	0.578	0.567		
0.576	118	0.515	0.54	0.533	0.527	0.54	147	0.535	0.558	0.569	0.534	0.567		
0.506	123	0.474	0.508	0.493	0.508	0.494	145	0.477	0.49	0.489	0.486	0.489		
0.495	123	0.469	0.503	0.509	0.477	0.505	145	0.465	0.496	0.507	0.47	0.511		
0.6	120	0.52	0.535	0.548	0.537	0.56	151	0.525	0.543	0.555	0.563	0.562		
0.594	120	0.527	0.529	0.566	0.546	0.568	151	0.513	0.525	0.555	0.521	0.551		
0.56	121	0.539	0.554	0.547	0.568	0.584	149	0.566	0.576	0.567	0.582	0.579		
0.568	121	0.527	0.556	0.565	0.539	0.56	149	0.547	0.566	0.586	0.558	0.581		
0.523	119	0.486	0.516	0.485	0.52	0.492	149	0.507	0.537	0.517	0.523	[illegible]		
0.506	119	0.48	0.497	0.537	0.496	0.527	149	0.513	0.53	0.543	0.5	0.54		
0.532	120	0.503	0.54	0.53	0.548	0.545	151	0.464	0.483	0.483	0.508	0.513		
0.54	120	0.505	0.542	0.554	0.51	0.53	151	0.462	0.479	0.514	0.453	[illegible]		
0.567	120	0.528	0.55	0.554	0.549	0.56	150	0.53	0.549	0.554	0.546	0.56	AVERAGE	

BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF
Q%-D1	I%-D1	O%-D1	K%-D1	M%-D1	Q%-D4	I%-D4	O%-D4	K%-D4	M%-D4	Q%-D7	I%-D7	O%-D7
0.000	3.120	1.054	4.836	4.786	10.701	7.452	8.084	8.981	7.179	8.303	9.359	3.515
-4.643	-2.265	1.900	-6.349	-1.199	4.464	-0.871	4.663	2.469	2.397	-5.179		-3.109
-2.626	-8.519	-7.024	-5.321	-3.670	3.232	-5.185	-7.948	-4.404	-1.101			
-2.045	0.000	3.488	-2.896	-3.390	[illegible]	3.808	4.845	-1.931	1.883			
7.582	11.914	12.865	9.793	10.795						11.885	9.570	5.068
3.854		-0.536		-1.232						5.395		1.250
					-4.120	-1.259	-5.082	-6.039	-2.330	-6.929	1.259	-6.171
					-3.371	-7.394	-5.052	-5.302	-4.847	-2.622	-6.690	-8.188
-3.168	4.642	3.696	-5.654	1.455	4.950	8.124	8.949	3.710	5.818	4.752	4.449	8.366
2.486	-2.247	2.909	4.633	-1.097	10.134	7.865	6.364	11.969	5.850	5.163	6.742	7.091
-2.416	-2.641	1.934	5.431	-0.722	0.372	1.408	7.157	6.742	1.986	1.115	-0.704	5.416
0.385	-2.722	-1.852	-1.923	-3.091	5.202	-2.359	3.889	5.962	2.545	4.432	2.359	3.704
-0.356	3.293	3.098	2.886	3.367	7.473	6.066	5.852	6.791	8.754	-5.872	-2.773	-4.475
7.934	4.655	10.517	4.676	1.349	14.207	6.897	10.160	9.353	4.722	-0.369	-1.207	0.713
8.073	2.683	7.595	7.295	5.585	7.890	8.229	13.743	8.719	7.853	6.239	7.692	9.403
6.134	3.136	3.020	0.709	[illegible]	7.435	3.310	7.993	6.383	8.406	7.993	6.794	5.329
-8.099	-7.586	-10.15	-6.599	-2.065	-6.690	-1.724	-5.245	0.846	0.000	-8.099	-1.724	-5.922
-0.178	-2.065	-5.963	-4.028	-7.692	0.000	0.172	0.170	-0.876	-7.692	0.000	1.721	2.044
5.720	2.124	8.316	0.379	3.571	10.593	7.529	11.765	12.689	13.534	8.051	6.950	13.590
5.422	7.466	12.576	7.495	3.654	12.249	[illegible]	11.968	9.665	10.192	9.036	13.752	14.807
4.688	2.214	6.910	9.890	3.710	8.398	7.565	12.092	11.905	6.714	6.641	6.827	9.405
5.939	5.827	8.224	3.697	[illegible]	8.238	11.654	13.458	6.285	9.619	9.962	11.466	13.832
-5.710	-2.093	-3.252	-3.454	2.419	3.915	8.696	8.618	7.378	13.871	-4.568	2.738	-0.976
1.846	-2.054	-0.966	1.320	-3.349	10.235	7.899	13.688	11.881	9.729	2.852	0.474	1.449
11.325	10.267	9.761	7.129	6.615						9.188	5.544	5.179
3.550	6.667	6.019	6.986	3.558						3.353	9.091	6.990
-3.363	1.565	3.791	0.846	3.066	6.195	4.522	8.664	5.245	7.496	3.009	6.087	10.108
4.100	3.147	1.692	0.856	4.514	6.417	5.245	7.107	5.822	7.813	8.021	5.769	5.922
-3.254	0.000	0.000	2.811	-2.544	1.952	1.643	4.357	4.217	3.523	9.328	1.848	1.037
1.417	-7.280	-1.338	0.000	1.524	0.810	2.107	4.971	2.976	0.952	2.429	-0.192	1.147
1.493	6.130	4.719	0.679	-0.340	7.090	6.480	7.260	5.772	7.993	4.291	1.751	6.715
1.248	3.839	1.541	7.579	7.330	3.565	7.853	7.877	10.906	8.377	1.426	4.887	3.596
0.911	5.396	1.257	2.618	5.670	-1.457	8.094	4.668	6.806	6.701	1.639	4.137	0.718
7.807	6.814	12.116	7.263	6.643	[illegible]	7.919	12.297	6.331	8.797	4.647	7.369	8.861
-2.827	-0.666	2.321	0.525	3.295	-7.244	-2.496	-1.250	0.350	-1.977	-2.473	-5.990	0.536
1.431	-0.346	1.466	3.405	7.917	-1.431	-1.730	-5.049	-1.254	2.410	0.179	1.384	-2.443
-9.474	-7.521	-5.496	-1.159	-1.363	-8.070	-5.299	-6.738	-4.801	-3.748	-6.667	-8.034	-7.270
-8.070	-12.83	-8.143	-9.474	-10.57	-3.509	-10.17	-9.121	-9.298	-6.879	-10.18	-14.000	-7.003
-1.978	6.777	3.825	2.435	3.652	-3.957	-1.465	-0.729	2.087	4.000	-7.194	-4.579	-4.554
0.181	5.206	-0.177	5.455	7.143	0.000	0.539	4.255	2.364	1.701	-4.537	-6.104	-4.255
-0.344	0.166	-3.583	-0.159	3.822	-2.065	2.653	-2.606	-1.274	2.389	-3.787	-1.161	-2.606
1.884	4.082	2.269	0.840	0.659	[illegible]	4.932	-0.810	-0.840	-0.329	1.884	2.041	-1.459
2.273	1.507	2.390	0.189	4.808	0.413	-0.942	1.195	1.509	8.462	4.752	3.390	4.183
3.958	2.935	0.377	-5.138	-0.019	4.375	1.761	-1.507	-2.174	0.757	3.333	3.914	3.578
-1.058	1.634	[illegible]	-4.723	-5.047	-2.469	-7.026	-10.13	-5.700	[illegible]	-5.291	-7.680	-11.897
-4.034	-4.950	-1.821	-6.290	-5.949	-4.202	-7.591	-7.616	-9.194	-10.129	-6.050	-10.066	-8.609
-8.851	-1.689	-6.844	-1.679	-5.797	-9.605	-4.503	-0.570	-2.425	-3.623	-5.085	1.501	-0.760
-2.980	-10.63	[illegible]	-3.781	-12.01	-2.793	-0.901	2.722	-3.781	-6.690	0.372	-0.360	4.537
4.646	6.012	7.098	6.719	-1.538	-3.030	3.607	4.802	0.988	-0.192	3.232	9.619	8.977
12.580	6.225	5.395	11.227	8.209	5.970	0.602	0.771	4.366	1.139	8.955	4.618	3.276
-3.462	-0.555	3.048	4.655	3.333	3.462	[illegible]	3.619	2.980	5.185	5.769	5.545	4.952
5.743	1.117	3.918	4.062	4.952	1.782	2.793	4.664	7.350	5.905	8.119	6.890	6.716
-5.699	4.049	0.000	-3.652	4.796	-1.838	8.097	3.285	2.261	1.954	-0.735	14.170	5.657
-2.471	-7.534	2.538	1.971	-5.299	3.042	-3.082	-3.553	6.093	0.684	2.852	-3.425	-5.245
10.769	15.048	10.586	10.642	10.507	17.308	20.571	15.123	14.862	15.572	14.808	18.476	17.769
7.940	10.878	6.250	9.126	7.339	8.885	11.641	6.985	13.786	8.073	6.805	9.351	6.801
2.206	3.310	5.382	4.828	4.631	6.066	4.007	2.431	3.966	1.715	3.125	-1.220	-0.694
10.150	4.930	3.993	5.115	4.310	6.579	4.049	4.167	1.587	-1.724	6.203	1.232	2.604
-3.352	1.261	-4.696	-2.508	5.254	0.186	-1.441	-9.391	-4.515	0.000			
	-3.209				-4.562	-2.317	-5.604	2.588	-5.085			
1.505	1.414	-7.332	-2.505	-0.996	0.860	5.859	5.092	5.395	9.562	0.645	-0.404	-3.055
-1.293	-2.004	1.590	1.290	-0.800	5.603	[illegible]	11.133	7.527	6.600	0.647	4.008	2.982
6.694	6.262	1.633	7.076	7.313	5.882	0.000	-3.811	2.048	-0.548	4.462	1.657	1.815
4.054	8.769	6.206	2.991	8.142	1.544	0.746	-4.787	-0.187	0.000	5.212	1.306	0.532
-5.882	-9.322	-10.75	-8.904	-6.988	-6.061	-2.881	-6.143	3.082	-2.163	-6.061	-8.814	-6.314
-9.139	-6.102	-6.885	-7.304	-9.656	-7.206	-5.932	-7.869	-3.652	-6.383	-5.624	-5.424	-5.246
-3.441	-7.169	-3.711	0.586	4.016	9.032	-0.735	4.883	9.961	12.450	-1.505	-6.801	-3.516
7.216	5.769	11.373	10.000	11.336	16.907	12.885	13.725	12.857	8.097	4.742	-1.923	6.275
6.298	-0.350	1.463	-2.401	-0.692	3.817	-0.699	0.731	-1.201	-1.384	7.824	1.748	2.194
0.182	1.571	[illegible]	2.182	3.636	1.821	1.396	10.987	0.727	4.364	2.732	5.585	12.477
6.832	2.924	1.972	4.571	9.589	4.348	5.068	-1.775	3.048	6.067			
6.303	11.045	4.054	2.772	3.320	6.933	3.550	3.475	-0.396	1.953			
1.225	1.354	1.758	1.567	1.775	2.893	2.517	2.975	3.270	3.010	2.075	2.122	2.233

CG	CH	CI	CJ	CK	CL	CM	CN	CO
K%-D7	M%-D7	Q%-D14	I%-D14	O%-D14	K%-D14	M%-D14	Q%-D21	I%-D21
4.836	0.342	9.410	7.106	1.582	6.563	0.171	5.166	5.199
-2.293	-5.137	-0.893	4.355	3.800	0.705	-0.685	3.571	2.613
		-3.636	-2.407	-6.470	-4.954	-2.202	-5.455	-3.889
		0.613	5.210	-0.775	-5.405	-4.331	-1.227	0.200
6.403	8.144	6.557	0.781	[illegible]	1.318	2.083	1.434	4.883
	-1.232	-2.119		-1.429		-6.796	-3.276	
-2.309	-3.226	4.307	5.036	-0.907	5.684	4.480	-0.749	0.719
-8.044	-3.052	7.491	3.169	4.355	4.205	4.309	0.749	0.000
1.590	0.545	3.168	-2.515	-0.778	-3.357	-0.909	5.347	5.609
9.266	8.044	0.000	0.936	-2.000	1.544	0.000	5.927	3.745
8.240	4.332	-0.558	-0.704	8.511	7.491	5.054	2.416	-2.113
2.500	0.000	0.963	-0.181	6.481	5.577	2.909	5.395	1.270
-0.509	-2.862	-2.491	0.000	[illegible]	-3.056	-6.229	-0.890	-3.466
-0.360	-6.745	0.185		-1.070	-1.619	-5.902	-0.554	-8.966
8.541	6.457	12.110	10.733	16.998	14.235	12.914	10.092	8.408
5.496	5.954	11.896	6.098	9.236	7.979	8.581	11.524	6.794
-0.846	-1.033	-7.042	-4.828	-8.291	-6.937	-4.131		
-3.327	-4.181	-6.394	-4.303	-3.748	-4.904	-5.518		
7.765	9.774	9.534	3.089	10.142	5.871	1.316	15.466	6.757
8.481	10.192	9.237	8.055	8.519	5.720	3.462	11.044	12.574
7.875	6.890	16.602	16.974	15.739	18.681	14.841	14.844	12.362
8.133	9.437	17.816	21.805	22.804	17.930	18.149	13.602	16.917
1.256	5.484	-6.688	-4.670	[illegible]	-6.907	-3.226	-4.078	-2.738
3.795	0.319	-2.685	-5.371	-1.771	-2.145	-5.263	0.503	-4.897
9.109	6.420	10.470	4.517	2.590	2.970	-0.195	2.991	5.955
6.986	2.809	-0.197	7.677	3.301	1.796	-0.749	-7.101	-3.434
4.399	8.007	8.319	7.652	10.108	10.660	7.496	4.425	5.391
3.596	10.069	7.487	9.266	6.091	4.623	9.201	7.130	6.294
0.602	1.761	-1.952	-5.749	-3.112	-0.201	-5.284	-5.206	0.821
2.778	0.952	0.000	-4.789	-0.765	2.183	-0.190	-2.024	-3.448
-2.207	3.231	3.545	3.327	1.996	0.679	-1.871	1.493	0.000
4.251	5.759	-0.357	0.873	0.514	5.360	0.349	-1.426	-0.873
4.014	1.375	0.729	10.971	2.873	8.726	3.093	4.554	10.432
3.352	4.309	7.063	11.602	[illegible]	5.587	8.079	11.338	13.996
3.503	-3.954	-9.011	-6.156	0.893	0.701	-3.789		-9.484
0.179	4.131	-0.894	-1.211	-6.026	1.971	-1.549	-11.270	
-7.285	-5.451	-4.561	-6.667	-4.255	-4.305	-8.177	-4.912	-2.393
-7.193	-9.732	-6.316	-10.50	-10.10	-8.070	-8.389	-4.035	-5.833
0.522	-5.217	-5.576	0.183	-6.557	-3.826	2.087	-7.374	-2.381
-4.182	-6.463	-1.452	-0.718	[illegible]	-1.273	-2.891	-3.811	-3.052
-3.503	-2.229	6.024	7.794	[illegible]	5.255	7.006	4.991	8.126
-3.866	0.165	11.473	10.884	7.942	9.412	10.873	6.678	9.694
1.698	8.269	3.099	0.188	2.191	1.887	6.731	6.198	0.942
-0.198	3.863	8.750	6.654	[illegible]	0.988	6.193	15.833	8.023
-8.795	-14.51	1.940	-2.288	-6.752	-3.094	-5.521	-1.587	-8.987
-8.710	-8.842	-4.874	-2.475	-2.980	-7.419	-1.608	-9.412	-9.406
1.866	0.181	-8.851	-3.565	[illegible]	-2.612	-1.087	-2.825	0.375
1.134	-2.573	-5.028	-8.829	-4.537	-3.970	-9.091	0.000	0.000
10.474	3.654	1.414	3.006	3.340	2.372	-0.577	0.404	4.008
10.811	6.245	9.595	2.811	0.963	8.940	3.496	10.235	2.410
5.400	5.185	3.077	4.067	[illegible]	6.331	7.037	8.846	9.427
10.058	8.381	4.950	3.352	6.903	3.868	9.143	10.693	6.145
1.739	6.217	-9.926	0.405	-5.657	-5.217	-2.309	-15.074	-0.810
1.613	-2.393	-2.471	-13.01	-10.32	-8.781	-11.111	-5.513	-19.35
13.578	18.386							
11.845	8.073							
0.862	-2.058	7.904	8.188	0.694	4.138	2.058	4.779	5.749
-0.529	-1.034	7.895	4.225	7.465	0.882	1.552	12.218	7.394
		-0.372	3.243	[illegible]	0.167	1.226	-0.931	2.342
		-0.730	1.783	-1.226	3.327	-2.373	-1.460	-3.030
-0.771	0.199						5.806	6.465
5.161	3.400						7.759	1.002
-1.304	4.753	-3.448	-5.525	-8.893	-2.980	-2.377	6.897	0.000
2.056	1.239	-3.475	-6.716	-9.397	-7.290	-6.195	1.544	2.612
0.856	-6.489	-1.783	-4.915	-6.826	-0.171	-4.160		
-7.478	-9.002	-4.394	-4.746	-4.918	-5.913	-6.874		
4.102	-0.803						-4.516	-13.05
5.102	9.109						1.649	-1.154
-0.172	0.692	12.786	7.343	11.152	10.635	10.208	12.023	4.545
4.727	4.364	10.747	14.311	[illegible]	12.545	14.182	5.464	4.712
		-2.070	4.094	-1.578	2.476	3.523	6.004	3.314
		3.151		4.247		2.148	6.933	3.945
2.257	1.650	1.971	1.888	1.386	1.837	0.945	2.604	1.710

CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ
O%-D21	I%-D21	O%-D21	K%-D21	M%-D21	O%-D28	I%-D28	O%-D28	K%-D28	M%-D28	O%-D60	I%-D60	O%-D60	K%-D60	M%-D60	O%-D90	I%-D90	O%-D90	K%-D90	M%-D90	O%-D120	I%-D120	O%-D120	I%-D120	M%-D120	O%-D150	I%-D150	O%-D150	K%-D150	M%-D150
5.166	5.199	1.793	5.354	3.077	4.613	-0.347	-3.515	-0.864	-2.051																				
3.571	2.613	3.627	0.178	-2.987	-2.500	0.348	-2.418	-0.176	5.479																				
-5.455	-3.889	-6.285	-4.037	-2.202	-3.434	-3.704	-8.688	-3.853	-5.138	5.342	0.000	1.294	-0.550	1.835	3.030	5.000	2.957	2.202	3.119	-1.010	1.852	-4.621	-10.275	-3.119	-2.424	-4.015	-6.654	-4.771	-4.404
-1.227	0.200	1.744	-2.703	-3.578	-4.294	1.202	2.713	-1.544	-0.565	3.067	6.613	8.721	3.089	2.637	6.953	13.828	10.078	5.792	5.461	6.736	0.000	-1.744	-7.722	-4.896	1.227	5.811	0.969	-4.440	0.186
1.434	4.883	-0.585	0.753	1.894	0.000	0.586	0.780	1.695	2.462	6.557	7.422	0.975	3.955	4.924	5.949	4.297	4.096	4.520	4.924	6.000	6.055	4.094	4.143	6.818	5.328	6.256	4.678	6.028	7.386
-9.276		-6.250		-6.162	-3.083		-5.357		-3.697	3.854		2.321		0.528	2.312		1.250		-1.761	0.771		0.000		-2.465	3.083		3.571		-2.289
-0.749	0.719	-2.359	-3.908	-1.792	-4.307	-4.856	-1.452	0.355	-3.226	-1.873	0.719	1.270	0.888	0.538	-5.993	-2.338	-4.174	-3.908	-6.631	-3.933	-0.719	-3.811	-4.440	-4.122					
0.749	0.000	-1.220	-5.302	-1.616	-5.000	-1.408	-1.220	-1.826	0.539	0.000	-0.352	-1.220	-0.366	0.539	-3.184	-5.810	-4.878	-3.473	-2.693	1.311	-4.049	-5.052	-5.302	-2.873					
8.154	3.000	5.043	3.347	7.021	10.000	6.000	10.526	8.895	8.443	6.801	7.570	7.894	8.177	6.548	4.286	8.317	6.144	5.504	4.188	6.595	7.111	8.171	2.473	8.364	6.931	5.996	8.948	3.357	7.273
5.927	3.745	7.091	7.915	5.302	8.429	8.614	11.455	13.505	12.066	6.501	5.243	7.273	11.390	8.044	4.398	5.618	7.091	8.687	4.936	7.839	5.431	8.545	7.338	7.130	2.486	3.184	7.696	12.165	7.678
2.416	-2.113	5.222	8.801	3.791	2.974	-2.113	7.737	7.481	8.245	2.602	1.937	13.733	12.734	7.581															
5.395	1.270	5.556	6.154	4.000	5.395	3.448	9.970	7.500	5.818	11.368	5.082	10.000	14.808	10.909															
-0.890	-3.466	-7.573	-5.940	-7.071	-4.448	-3.640	-5.184	-4.024	-8.754	0.356	1.386	-2.754	-1.188	-0.505	0.534	1.560	-2.238	-2.377	-1.016	-5.160	-4.506	-6.362	-5.263	7.744	3.025	6.932	3.094	2.547	-0.196
-0.554	-8.966	-1.428	-1.258	-5.059	1.292	-2.931	-0.997	-5.298	-6.745	3.137	-1.379	4.456	1.799	0.000	3.321	-2.931	0.535	-1.439	-6.405	0.185	-4.483	0.713	-1.439	-6.408	9.410	3.103	6.954	5.935	0.506
10.092	8.408	13.020	10.954	8.202	13.211	15.921	15.631	16.370	11.169	8.073	8.408	11.031	11.032	6.632	4.771	6.619	7.595	4.093	7.155	-2.018	-1.789	0.723	1.348	1.743	8.257	8.587	8.680	7.651	7.390
11.524	6.794	8.703	11.348	11.033	12.082	10.453	12.256	14.507	12.259	12.639	7.840	10.302	10.936	8.056	5.019	2.265	6.039	4.078	3.327	1.859	-0.348	0.433	-2.128	-0.525	11.524	6.794	7.460	3.369	9.282
					-13.204	-7.931	-10.996	-7.107	-7.401	-1.761	0.000	-2.876	-4.230	2.754	-4.401	-1.207	-3.048	0.169	3.787	-9.507	-4.136	-8.023	-5.245	-1.895	-6.690	-5.345	-7.107	-5.415	-2.583
					-7.460	-8.262	-9.370	-8.757	-10.702	5.861	1.205	2.381	3.327	-4.348	3.730	-2.065	0.341	-0.350	1.003	-2.131	-2.238	-0.237	-2.452	-4.948	-6.035	-4.303	-5.622	-4.028	-8.521
15.466	6.757	12.778	9.659	6.579	16.737	9.653	14.199	8.902	11.278	14.407	9.459	14.199	8.523	8.459	4.873	2.703	5.477	-0.569	1.880										
11.044	12.574	16.430	8.087	10.192	11.847	12.967	19.675	9.665	12.115	12.651	13.168	19.675	10.651	8.654	1.205	3.929	9.736	2.170	4.038										
14.844	12.362	16.891	14.103	12.898	11.328	9.594	9.597	8.608	7.597	12.500	12.731	12.860	12.271	9.364	8.398	3.690	8.061	1.465	-0.177	12.695	8.672	12.585	13.370	7.067	4.105	0.554	3.847	1.469	-1.767
13.608	16.917	17.383	13.494	16.152	13.027	13.910	15.140	10.351	10.526	15.709	13.534	19.252	14.048	15.971	7.280	10.150	9.159	5.545	7.078	14.751	13.534	14.884	10.166	10.706	2.107	1.880	4.486	3.327	-0.728
-4.078	-2.738	-2.927	-4.239	-0.484	-1.831	1.610	3.740	0.314	5.000	-4.894	-3.060	-2.276	-4.239	-3.548	-8.483	-7.407	-5.203	-8.634	-4.677	-8.804	-5.153	-1.941	-8.006	-2.419	-5.873	-4.187	-0.813	-3.140	-0.161
0.503	-4.897	-0.161	-0.330	-2.392	5.537	0.158	5.155	4.950	4.785	1.007	-3.630	0.805	3.465	-0.957	-6.376	-6.951	-1.771	-3.798	-3.190	-1.678	-2.212	-2.993	-0.495	-1.116	-1.345	-3.791	-1.449	-1.485	-0.478
2.991	5.955	2.191	1.306	-0.973	9.188	8.214	3.187	5.743	3.891	19.658	14.374	10.359	13.663	11.284	15.812	16.222	9.163	10.498	7.977	7.682	7.800	7.930	7.525	3.112	7.908	6.776	5.578	4.158	2.140
-7.101	-3.434	-6.408	-3.593	-7.865	0.789	6.869	3.301	7.984	0.562	10.454	15.754	9.320	13.174	6.554	7.495	10.909	9.320	10.978	4.869	5.523	8.267	6.019	5.190	3.371	-0.197	5.858	3.883	0.200	-1.873
4.425	5.391	7.942	4.399	7.666	-0.177	-1.043	4.874	-0.338	3.576																				
7.130	6.294	7.276	4.795	9.549	3.743	3.671	4.061	-0.856	5.362																				
-5.206	0.821	1.867	1.606	-0.783	3.905	4.729	1.452	4.217	-0.587	3.254	2.875	5.394	3.414	5.871	8.894	8.214	7.469	4.217	5.675	5.857	5.133	4.979	5.020	2.740	4.772	3.888	-0.207	0.491	1.566
-2.024	-3.448	1.912	-0.595	-0.571	1.012	0.766	-0.574	1.984	-1.714	15.182	9.958	4.971	1.587	4.571	6.073	2.682	3.442	3.968	1.714	0.405	-0.386	3.045	-0.595	9.048	2.927	1.918	-3.890	2.381	-3.238
1.493	0.000	-1.452	-0.509	-1.701	0.560	2.627	3.502	-2.715	-5.741	-2.985	-2.277	-0.363	-6.282	-3.401	0.746	-1.751	1.089	-3.905	-6.122										
-1.426	-0.873	2.055	1.864	-0.688	-2.674	-0.175	3.035	3.142	0.949	-3.565	-1.745	-1.370	-0.739	-4.014	-7.130	-1.398	-1.370	-1.109	-2.792										
4.554	10.432	7.002	11.344	6.529	5.464	11.871	5.208	7.330	6.873	12.003	10.025	8.797	8.551	11.340	2.186	5.216	4.668	5.061	3.608	0.911	8.268	0.814	5.061	0.887	4.377	7.014	8.268	5.410	5.498
11.339	13.996	15.190	9.311	13.285	13.197	14.549	13.054	10.426	10.413	15.806	15.470	13.201	10.056	12.208	3.160	7.735	6.148	6.518	3.591	2.416	6.814	6.149	2.235	8.797	7.407	13.260	13.201	11.359	8.977
	-9.484	-10.536	-7.708	-11.862	-3.887	-8.819	-1.907	-2.102	-5.766	-5.770	-7.488	-1.077	-0.701	-6.755	-2.120	-1.498	2.679	0.525	-5.272	6.360	2.827	11.075	12.809	5.601	-8.481	-10.316	-5.714	-6.305	-6.919
11.270		-15.147	-6.810	-7.573	-3.220	-1.903	-8.518	0.538	-0.688	-1.886	-3.425	-5.813	1.434	1.721	2.862	1.038	-2.280	1.613	3.787	10.197	4.576	5.048	12.903	9.122	-3.578	-6.401	-9.772	-5.018	-5.852
-4.912	-2.393	-4.610	-3.808	-0.341	7.544	-6.838	-0.147	-2.980	-3.748	-4.913	-5.641	-3.014	-5.464	-4.600	-8.421	-10.944	-4.433	-7.781	-4.940	-7.895	-4.799	-2.485	-7.947	-3.407	-8.246	-6.496	-3.369	-9.272	-5.622
-4.174	5.833	-8.084	-8.084	-4.850	8.158	8.053	4.700	-10.118	-8.201	-2.184	-8.838	-8.772	-8.740	-4.966	-9.845	-5.880	-2.555	-3.133	-4.178	-6.248	-7.827	-7.601	-3.684	-4.698	-4.912	-7.500	-7.655	-8.947	-7.550
-7.374	-2.381	-1.821	-4.670	-2.783	-1.978	1.099	1.681	-2.261	2.783	-3.979	1.000	1.457	-2.087	4.348	-0.899	2.930	2.186	2.783	3.826	-11.691	-7.550	-6.195	-6.608	-9.913	-2.578	1.832	0.364	-0.522	2.435
-3.811	-3.052	-1.241	-2.182	-3.912	-0.726	-0.898	0.385	2.364	-0.680	-0.141	-1.795	2.960	2.182	2.211	1.815	0.000	0.532	2.182	1.020	-8.530	-10.054	-7.098	-5.636	-11.565	1.815	-2.334	-0.532	2.182	-5.102
4.991	8.126	0.977	1.274	3.662	2.582	4.312	-0.326	3.025	5.892	7.224	8.761	5.855	6.369	7.325	6.024	7.463	5.375	3.503	4.140	5.680	5.643	5.813	4.459	1.433	-0.344	4.146	-1.629	-1.115	2.229
6.678	9.694	7.942	5.378	7.414	6.336	7.483	4.376	3.025	7.249	9.418	11.905	8.590	10.252	10.873	7.705	10.204	6.807	8.403	8.567	7.534	11.395	8.807	6.555	6.590	3.425	5.612	5.348	8.188	4.942
6.198	0.942	7.371	9.057	10.192	4.132	3.578	3.786	-1.698	5.192	5.165	0.188	3.984	-0.189	5.000	8.471	3.578	4.183	-1.509	5.000	-0.413	-3.390	0.996	-3.585	-2.308	4.752	-0.377	2.590	1.321	0.192
15.833	8.023	7.910	6.522	11.241	8.333	1.566	2.828	0.000	2.116	9.167	5.479	3.955	3.162	6.970	7.500	1.957	2.826	2.372	5.222	-0.417	-0.978	-3.396	-6.324	-5.844	1.875	0.783	-0.565	-4.743	3.863
-1.587	-8.987	-10.289	-7.980	-10.252	-2.293	-7.026	-5.456	-4.560	-6.782	1.058	-4.248	-6.431	-3.583	-5.836															
-9.412	-9.402	-7.148	-10.97	-8.360	-4.570	-6.125	-1.490	-4.839	-5.145	-1.178	-3.795	-2.649	-3.548	-4.662															
0.000	8.008	8.008	-0.738	-5.960	4.840	4.084	10.526	7.881	8.173	7.440	8.008	8.884	8.970	-2.218															
11.803	8.376	-0.340	1.497	-1.539	7.548	11.802	8.421	8.978	11.485	8.855	7.561	8.238	4.954	7.867															
0.404	4.008	5.846	4.150	0.577	-0.805	2.904	4.802	4.348	-2.115	2.628	10.322	10.230	9.250	5.962	5.561	15.437	13.152	11.265	6.036	-2.424	8.417	5.010	3.963	6.154	1.616	9.419	5.846	5.139	0.385
10.235	2.416	0.771	1.663	-0.038	5.330	4.618	2.697	4.158	-0.628	11.087	8.033	6.744	11.435	8.405	13.646	14.257	12.130	13.159	14.101	10.448	6.426	4.239	5.198	9.248	11.087	8.233	6.166	8.940	7.423
5.848	8.487	6.114	11.865	11.337	9.850	6.100	8.952	12.477	9.259	-1.731	-1.664	-1.524	1.490	2.037	0.000	0.185	3.429	2.235	1.667	1.346	2.218	4.571	3.407	3.844	-0.192	-2.033	-0.571	-0.372	-0.926
10.003	6.145	10.634	12.760	14.268	11.287	4.466	8.209	13.926	12.571	1.980	-2.421	2.612	2.321	4.381	4.554	0.559	5.037	4.255	4.381	5.545	2.235	3.545	5.803	6.180	2.970	-4.097	2.985	0.000	5.524
15.074	-0.810	-8.212	-11.65	-5.506	-4.228	6.070	-2.372	-4.696	-4.973	0.551	12.148	3.650	1.913	4.085	2.206	16.194	6.569	5.739	3.020	-3.125	10.324	-0.730	-2.957	-3.197	-8.456	1.215	-2.555	-7.652	-6.927
-5.513	-19.35	-15.398	-9.857	-9.402	-3.232	-12.328	-7.445	-2.151	-3.599	7.224	-3.425	-1.692	3.763	-2.051	9.506	0.171	0.338	6.093	-1.709	-0.951	-5.479	-5.584	-5.556	-4.274	-2.091	10.616	-6.599	-6.273	-6.838
4.779	5.749	3.993	6.207	4.460	6.434	5.052	0.694	1.897	1.718	-2.206	-2.439	-2.604	-5.617	-5.832	4.598	5.401	2.951	5.345	1.715	4.596		0.174	4.828	-2.573	-2.022	2.613	-0.174	-0.174	0.172
12.218	7.394	6.777	6.702	3.414	11.654	3.873	5.903	4.762	2.586	1.880	-2.465	-1.910	-2.293	-8.793	5.827	4.577	6.076	4.056	0.000	2.820	-2.115	1.563	2.295	-0.343	4.699	0.176	3.120	-0.176	-2.069
-0.931	2.342	-8.875	-4.849	-4.203	-1.304	0.901	-2.261	-1.839	0.875	-0.372	1.802	-1.913	-4.662	3.853	-6.899	-1.622	-4.870	-8.361	-3.152	-10.058	-7.387	-11.304	-12.040	-7.005	-1.117	-0.180	-5.217	-3.344	-0.701
-1.450	-3.035	-4.904	-1.664	-10.508	-1.277	4.456	-1.226	3.697	-5.763	0.912	3.742	1.051	2.588	0.164	-3.268	-2.317	-4.553	-1.848	-2.373	-6.022	-3.743	-6.655	-2.588	-8.472	-2.372	-0.535	-0.350	-1.294	-3.898
5.806	6.464	0.000	-0.193	4.163	3.656	3.838	0.611	2.110	7.371	6.237	8.081	6.314	2.119	6.375	-0.640	1.218	1.018	1.541	0.797	1.935	2.626	0.407	-2.119	-1.594	2.581	-1.010	-0.401	-6.350	-2.590
7.759	1.002	3.181	8.387	3.200	6.466	2.806	2.985	9.892	3.000	10.345	3.607	6.561	8.387	5.400	1.508	1.605	2.783	2.796	-1.000	1.078	0.802	1.193	2.581	1.000	0.218	-0.601	0.795	1.075	2.200
6.897	0.000	0.546	3.357	5.850	16.024	4.604	0.181	10.242	11.700	13.385	10.313	5.989	15.456	14.260	13.793	6.267	4.537	10.056	9.689	5.477	-1.473	-0.544	0.000	2.377	6.491	0.000	0.726	4.842	2.742
1.544	2.612	0.539	2.804	1.947	10.426	11.194	7.091	7.471	8.496	11.969	4.478	5.486	9.907	5.841	9.268	7.091	4.078	7.664	5.193	1.737	-1.306	0.355	2.058	0.531	-0.965	-2.052	-1.598	-2.617	-2.478
					-3.387	-6.271	-3.928	2.228	-2.995	0.891	-0.508	-2.730	-0.514	-2.329	-4.991	-4.407	-5.973	-4.281	-6.822	-3.922	-6.102	-6.655	-2.740	-2.825	0.891	-2.373	-3.242	-0.342	-3.661
					-3.866	-6.271	-3.607	-2.954	-6.547	-3.691	-0.339	-0.492	-3.130	-1.964	-4.745	-5.424	-5.902	-4.000	-7.038	-7.381	-5.763	-7.371	-6.261	-8.347	-3.864	-4.068	-3.934	-2.957	-4.912
4.516	-13.05	-4.688	-4.297	-4.418	-3.226	-7.904	-5.664	-1.563	-0.803	10.323	0.000	3.320	9.766	9.839	4.086	-7.169	-1.758	3.516	5.020	4.516	-5.147	-5.275	1.563	-1.205	9.007	-1.287	0.977	2.148	6.426
1.649	-1.154	2.941	2.449	3.846	-2.268	-5.577	-0.588	-6.531	1.015	9.275	4.615	10.392	7.959	7.085	2.268	-0.192	5.294	0.204	2.429	-1.031	-4.423	5.294	1.224	6.680	5.773	1.923	6.471	2.041	9.312
12.023	4.543	7.313	3.431	3.633	15.458	9.091	8.044	8.405	7.958	7.634	3.147	2.194	-1.544	0.865															
5.464	4.712	12.104	11.273	7.818	8.379	7.504	14.711	8.188	10.727	4.378	2.443	10.428	3.836	6.909															
6.004	3.914	0.000	2.286	4.501	8.282	5.848	4.931	6.667	8.806	8.696	5.263	2.761	4.381	7.241	7.660	5.069	3.359	2.857	4.110	4.141	5.263	4.537	4.381	6.654	-3.934	-5.846	-4.734	-3.238	0.391
6.933	3.845	8.018	3.358	5.808	13.445	9.665	7.336	8.178	5.469	7.353	3.353	6.757	3.960	6.641	7.563	4.734	4.054	1.386	5.469	6.092	6.903	6.950	0.990	3.518	-2.941	-5.523	-0.772	-10.297	-2.344
2.604	1.710	1.859	1.905	-1.459	3.040	2.416	2.611	2.729	2.150	4.811	3.348	4.013	3.795	3.485	2.790	2.730	2.866	2.230	1.715	0.772	0.777	0.752	0.262	0.223	1.208	0.463	0.741	-0.185	0.220

APPENDIX H

STATISTICAL DATA OF CORNEAL THICKNESS MEASUREMENT AT FIVE LOCATIONS OVER TIME

CENTRAL THICKNESS CHANGES - PERMAFLEX

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.009	.001	.531
Within groups	121	.198	.002	p > .25
Total	131	.206		

Model II estimate of between component variance = -.00006392

1

Group	Count:	Mean:
Column 1	12	.531
Column 2	12	.535
Column 3	12	.545
Column 4	12	.546
Column 5	12	.537

2

Group:	Count:	Mean:
Column 6	12	.536
Column 7	12	.544
Column 8	12	.561
Column 9	12	.545
Column 10	12	.532

3

Group:	Count:	Mean:
Column 11	12	.537

4

SUPERIOR THICKNESS CHANGES - PERMAFLEX

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.007	.001	.394
Within groups	121	.214	.002	p > .25
Total	131	.221		

Model II estimate of between component variance = -.00008929

1

Group:	Count:	Mean:
Column 1	12	.552
Column 2	12	.549
Column 3	12	.56
Column 4	12	.564
Column 5	12	.551

2

Group:	Count:	Mean:
Column 6	12	.554
Column 7	12	.569
Column 8	12	.568
Column 9	12	.568
Column 10	12	.552

3

Group:	Count:	Mean:
Column 11	12	.554

4

NASAL THICKNESS CHANGES - PERMAFLEX

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.008	.001	.413
Within groups	121	.242	.002	p > .25
Total	131	.25		

Model II estimate of between component variance = -.00009777

1

Group:	Count:	Mean:
Column 1	12	.545
Column 2	12	.551
Column 3	12	.563
Column 4	12	.558
Column 5	12	.551

2

Group:	Count:	Mean:
Column 6	12	.549
Column 7	12	.561
Column 8	12	.566
Column 9	12	.561
Column 10	12	.547

3

Group:	Count:	Mean:
Column 11	12	.541

4

TEMPORAL THICKNESS CHANGES - PERMAFLEX

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.006	.001	.367
Within groups	121	.212	.002	p > .25
Total	131	.218		

Model II estimate of between component variance = -.0000923

1

Group:	Count:	Mean:
Column 1	12	.565
Column 2	12	.567
Column 3	12	.571
Column 4	12	.572
Column 5	12	.561

2

Group:	Count:	Mean:
Column 6	12	.563
Column 7	12	.575
Column 8	12	.582
Column 9	12	.576
Column 10	12	.559

3

Group:	Count:	Mean:
Column 11	12	.561

4

INFERIOR THICKNESS CHANGES - PERMAFLEX

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.006	.001	.327
Within groups	121	.212	.002	p > .25
Total	131	.218		

Model II estimate of between component variance = -.00009835

1

Group:	Count:	Mean:
Column 1	12	.564
Column 2	12	.57
Column 3	12	.576
Column 4	12	.573
Column 5	12	.564

2

Group:	Count:	Mean:
Column 6	12	.564
Column 7	12	.574
Column 8	12	.583
Column 9	12	.577
Column 10	12	.564

3

Group:	Count:	Mean:
Column 11	12	.562

4

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.009	.001	.724
Within groups	143	.168	.001	p > .25
Total	153	.176		

Model II estimate of between component variance = -.00002312

1

Group:	Count:	Mean:
Column 1	14	.526
Column 2	14	.534
Column 3	14	.546
Column 4	14	.534
Column 5	14	.537

2

Group:	Count:	Mean:
Column 6	14	.541
Column 7	14	.542
Column 8	14	.55
Column 9	14	.541
Column 10	14	.53

3

Group:	Count:	Mean:
Column 11	14	.526

4

SUPERIOR THICKNESS CHANGES - SYNTEX CSI-T

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.009	.001	.756
Wihin groups	143	.163	.001	p > .25
Total	153	.171		

Model II estimate of between component variance = -.00001988

1

Group:	Count:	Mean:
Column 1	14	.545
Column 2	14	.557
Column 3	14	.566
Column 4	14	.556
Column 5	14	.566

2

Group.	Count:	Mean:
Column 6	14	.552
Column 7	14	.552
Column 8	14	.564
Column 9	14	.558
Column 10	14	.549

3

Group:	Count:	Mean:
Column 11	14	.544

4

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.01	.001	.905
Within groups	143	.153	.001	p > .25
Total	153	.163		

Model II estimate of between component variance = -.000007278

1

Group:	Count:	Mean:
Column 1	14	.556
Column 2	14	.568
Column 3	14	.582
Column 4	14	.574
Column 5	14	.578

2

Group:	Count:	Mean:
Column 6	14	.564
Column 7	14	.566
Column 8	14	.58
Column 9	14	.569
Column 10	14	.565

3

Group:	Count:	Mean:
Column 11	14	.559

4

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.006	.001	.505
Within groups	143	.182	.001	p > .25
Total	153	.189		

Model II estimate of between component variance = -.00004505

1

Group:	Count:	Mean:
Column 1	14	.535
Column 2	14	.547
Column 3	14	.556
Column 4	14	.544
Column 5	14	.549

2

Group:	Count:	Mean:
Column 6	14	.542
Column 7	14	.543
Column 8	14	.556
Column 9	14	.55
Column 10	14	.541

3

Group:	Count:	Mean:
Column 11	14	.537

4

INFERIOR THICKNESS CHANGES - SYNTEX CSI-T

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.006	.001	.425
Within groups	143	.185	.001	p > .25
Total	153	.191		

Model II estimate of between component variance = -.00005325

1

Group:	Count:	Mean:
Column 1	14	.559
Column 2	14	.57
Column 3	14	.572
Column 4	14	.568
Column 5	14	.571

2

Group:	Count:	Mean:
Column 6	14	.563
Column 7	14	.561
Column 8	14	.574
Column 9	14	.563
Column 10	14	.558

3

Group:	Count:	Mean:
Column 11	14	.555

4

CENTRAL THICKNESS CHANGES - HYDROCURVE II

66K

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.013	.001	.79
Within groups	275	.447	.002	p > .25
Total	285	.46		

Model II estimate of between component variance = -.00001312

1

Group:	Count:	Mean:
Column 1	26	.521
Column 2	26	.527
Column 3	26	.535
Column 4	26	.534
Column 5	26	.535

2

Group:	Count:	Mean:
Column 6	26	.527
Column 7	26	.535
Column 8	26	.547
Column 9	26	.539
Column 10	26	.526

3

Group:	Count:	Mean:
Column 11	26	.53

4

SUPERIOR THICKNESS CHANGES - HYDROCURVE II

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.011	.001	.732
Wihin groups	275	.418	.002	p > .25
Total	285	.429		

Model II estimate of between component variance = -.00001564

1

Group:	Count:	Mean:
Column 1	26	.547
Column 2	26	.553
Column 3	26	.564
Column 4	26	.556
Column 5	26	.555

2

Group:	Count:	Mean:
Column 6	26	.551
Column 7	26	.558
Column 8	26	.566
Column 9	26	.563
Column 10	26	.55

3

Group:	Count:	Mean:
Column 11	26	.55

4

NASAL THICKNESS CHANGES - HYDROCURVE II

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.014	.001	.942
Within groups	275	.408	.001	p > .25
Total	285	.422		

Model II estimate of between component variance = -.00000332

1

Group:	Count:	Mean:
Column 1	26	.558
Column 2	26	.568
Column 3	26	.58
Column 4	26	.57
Column 5	26	.568

2

Group:	Count:	Mean:
Column 6	26	.562
Column 7	26	.572
Column 8	26	.576
Column 9	26	.572
Column 10	26	.56

3

Group:	Count:	Mean:
Column 11	26	.558

4

TEMPORAL THICKNESS CHANGES - HYDROCURVE II

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.011	.001	.701
Within groups	275	.438	.002	p > .25
Total	285	.449		

Model II estimate of between component variance = -.0000183

1

Group:	Count:	Mean:
Column 1	26	.541
Column 2	26	.546
Column 3	26	.555
Column 4	26	.549
Column 5	26	.544

2

Group:	Count:	Mean:
Column 6	26	.544
Column 7	26	.55
Column 8	26	.561
Column 9	26	.556
Column 10	26	.544

3

Group:	Count:	Mean:
Column 11	26	.543

4

INFERIOR THICKNESS CHANGES - HYDROCURVE II

One Way ANOVA 11 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	10	.018	.002	1.174
Within groups	275	.424	.002	p > .25
Total	285	.442		

Model II estimate of between component variance = .0000103

1

Group:	Count:	Mean:
Column 1	26	.557
Column 2	26	.57
Column 3	26	.582
Column 4	26	.568
Column 5	26	.564

2

Group:	Count:	Mean:
Column 6	26	.564
Column 7	26	.573
Column 8	26	.582
Column 9	26	.571
Column 10	26	.56

3

Group:	Count:	Mean:
Column 11	26	.561

4

CENTRAL THICKNESS CHANGES - CONTROLS

One Way ANOVA 6 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F test:
Between groups	5	.003	.001	.637
Within groups	42	.042	.001	p > .25
Total	47	.045		

Model II estimate of between component variance = -.00004491

1

Group	Count:	Mean:
Column 1	8	.523
Column 2	8	.52
Column 3	8	.513
Column 4	8	.505
Column 5	8	.5

2

Group	Count:	Mean:
Column 6	8	.509

3

SUPERIOR THICKNESS CHANGES - CONTROLS

66Q

One Way ANOVA 6 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	5	.003	.001	.561
Within groups	42	.049	.001	p > .25
Total	47	.052		

Model II estimate of between component variance = -.00006348

1

Group:	Count:	Mean:
Column 1	8	.547
Column 2	8	.543
Column 3	8	.534
Column 4	8	.528
Column 5	8	.523

2

Group:	Count:	Mean:
Column 6	8	.536

3

NASAL THICKNESS CHANGES - CONTROLS

One Way ANOVA 6 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	5	.003	.001	.683
Within groups	42	.031	.001	p > .25
Total	47	.033		

Model II estimate of between component variance = -.000029

1

Group:	Count:	Mean:
Column 1	8	.546
Column 2	8	.557
Column 3	8	.537
Column 4	8	.538
Column 5	8	.537

2

Group:	Count:	Mean:
Column 6	8	.544

3

TEMPORAL THICKNESS CHANGES - CONTROLS

One Way ANOVA 6 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	5	.002	.0003226	.327
Within groups	42	.041	.001	p > .25
Total	47	.043		

Model II estimate of between component variance = -.00008299

1

Group.	Count:	Mean:
Column 1	8	.526
Column 2	8	.527
Column 3	8	.525
Column 4	8	.521
Column 5	8	.511

2

Group	Count:	Mean:
Column 6	8	.516

3

INFERIOR THICKNESS CHANGES - CONTROLS

One Way ANOVA 6 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	5	.002	.0004185	.547
Within groups	42	.032	.001	p > .25
Total	47	.034		

Model II estimate of between component variance = -.00004328

1

Group:	Count:	Mean:
Column 1	8	.544
Column 2	8	.553
Column 3	8	.539
Column 4	8	.536
Column 5	8	.535

2

Group:	Count:	Mean:
Column 6	8	.535

3

APPENDIX I

STATISTICAL DATA AND FREQUENCY DISTRIBUTION ON FIVE CORNEAL LOCATIONS PRIOR TO WEAR OF CONTACT LENSES

CENTRAL MEASUREMENT
52 EYES

STATISTICAL DATA

Column 1					
Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
.525	.039	.005	.002	7.431	52
Minimum:	Maximum:	Range:	Sum:	Sum Squared:	* Missing:
.461	.613	.152	27.297	14.407	0
Median:	Mode:	Geo. Mean:	Har. Mean:	Kurtosis:	Skewness:
.525	•	.524	.522	-.945	.07

FREQUENCY DISTRIBUTION

Column 1					
Bar:	From: (≥)	To: (<)	Count:	Percent:	
1	.461	.476	7	13.462	
2	.476	.492	6	11.538	
3	.492	.507	6	11.538	
4	.507	.522	6	11.538	
5	.522	.538	4	7.692	
6	.538	.553	9	17.308	-Mode
7	.553	.568	7	13.462	
8	.568	.583	4	7.692	
9	.583	.599	2	3.846	
10	.599	.614	1	1.923	

SUPERIOR MEASUREMENT
52 EYES

STATISTICAL DATA

Column 1

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
.548	.037	.005	.001	6.81	52
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum Squared:**	**# Missing:**
.487	.633	.146	28.471	15.659	0
Median:	**Mode:**	**Geo. Mean:**	**Har. Mean:**	**Kurtosis:**	**Skewness:**
.543	.499	.546	.545	-.833	.149

FREQUENCY DISTRIBUTION

Column 1

Bar:	From: (≥)	To: (<)	Count:	Percent:	
1	.487	.502	9	17.308	
2	.502	.516	4	7.692	
3	.516	.531	4	7.692	
4	.531	.546	10	19.231	←Mode
5	.546	.561	6	11.538	
6	.561	.575	4	7.692	
7	.575	.59	8	15.385	
8	.59	.605	5	9.615	
9	.605	.619	0	0	
10	.619	.634	2	3.846	

NASAL MEASUREMENT
52 EYES

STATISTICAL DATA

Column 1					
Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
.554	.037	.005	.001	6.669	52
Minimum:	Maximum:	Range:	Sum:	Sum Squared:	# Missing:
.481	.628	.147	28.822	16.045	0
Median:	Mode:	Geo. Mean:	Har. Mean:	Kurtosis:	Skewness:
.551	•	.553	.552	-.885	.112

FREQUENCY DISTRIBUTION

Column 1				
Bar:	From: (≥)	To: (<)	Count:	Percent:
1	.481	.496	1	1.923
2	.496	.511	7	13.462
3	.511	.525	5	9.615
4	.525	.54	8	15.385
5	.54	.555	6	11.538
6	.555	.57	5	9.615
7	.57	.585	8	15.385
8	.585	.599	6	11.538
9	.599	.614	3	5.769
10	.614	.629	3	5.769

TEMPORAL MEASUREMENT
52 EYES

STATISTICAL DATA

Column 1

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
.545	.038	.005	.001	6.993	52
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum Squared:**	*** Missing:**
.465	.637	.172	28.35	15.531	0
Median:	**Mode:**	**Geo. Mean:**	**Har. Mean:**	**Kurtosis:**	**Skewness:**
.55	•	.544	.543	-.529	.069

FREQUENCY DISTRIBUTION

Column 1

Bar:	From: (≥)	To: (<)	Count:	Percent:	
1	.465	.482	3	5.769	
2	.482	.499	2	3.846	
3	.499	.517	9	17.308	
4	.517	.534	5	9.615	
5	.534	.551	9	17.308	
6	.551	.568	10	19.231	←Mode
7	.568	.585	6	11.538	
8	.585	.603	4	7.692	
9	.603	.62	3	5.769	
10	.62	.637	1	1.923	

INFERIOR MEASUREMENT
52 EYES

STATISTICAL DATA

Column 1					
Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
.559	.037	.005	.001	6.664	52
Minimum:	Maximum:	Range:	Sum:	Sum Squared:	* Missing:
.494	.628	.134	29.077	16.33	0
Median:	Mode:	Geo. Mean:	Har. Mean:	Kurtosis:	Skewness:
.566	*	.558	.557	-1.096	-.067

FREQUENCY DISTRIBUTION

Column 1				
Bar:	From: (≥)	To: (<)	Count:	Percent:
1	.494	.507	4	7.692
2	.507	.521	8	15.385
3	.521	.534	5	9.615
4	.534	.548	4	7.692
5	.548	.561	3	5.769
6	.561	.574	7	13.462
7	.574	.588	8	15.385
8	.588	.601	7	13.462
9	.601	.615	3	5.769
10	.615	.628	3	5.769

APPENDIX J

ENDOTHELIUM CELL COUNT AND STATISTICS SUBJECTS AND CONTROL PATIENTS

PT. NO.	EYE	DAY 0 # CELLS	DAY 150 # CELLS	NOTES CELLS RATED - CHANGE NOTED
102	OD	3200	3200	MODERATE POLYMEGATHISM - NO SIGNIFICANT CHANGE
102	OS	3100	3100	MODERATE POLYMEGATHISM - NO SIGNIFICANT CHANGE
103	OD	3200	3200	MODERATE POLYMEGATHISM - NO SIGNIFICANT CHANGE
103	OS	3200	3200	MODERATE POLYMEGATHISM - NO SIGNIFICANT CHANGE
105	OD	3200	3100	NORMAL - NO SIGNIFICANT CHANGE
105	OS	3100	3200	NORMAL - NO SIGNIFICANT CHANGE
107	OD	3100	3100	NORMAL TO SLIGHT POLYMEGATHISM - SMALL INCREASE
107	OS	3100	3100	NORMAL TO SLIGHT POLYMEGATHISM - SMALL INCREASE
108	OD	3200	3200	NORMAL - NO SIGNIFICANT CHANGE
108	OS	3200	3300	NORMAL - NO SIGNIFICANT CHANGE
109	OD	2800	2800	MODERATE POLYMEGATHISM - NO SIGNIFICANT CHANGE
109	OS	2800	2800	MODERATE POLYMEGATHISM - NO SIGNIFICANT CHANGE
111	OD	3100	3200	NORMAL - NO SIGNIFICANT CHANGE
111	OS	3300	3300	NORMAL - NO SIGNIFICANT CHANGE
112	OD	2800	3000	SLIGHT POLYMEGATHISM - SMALL INCREASE
112	OS	2600	2900	SLIGHT POLYMEGATHISM - SMALL INCREASE
113	OD	2800	2800	MODERATE POLYMEGATHISM - NO SIGNIFICANT CHANGE
113	OS	2800	2800	MODERATE POLYMEGATHISM - NO SIGNIFICANT CHANGE
115	OD	2700	2700	MODERATE POLYMEGATHISM - SLIGHT INCREASE
115	OS	2700	2700	MODERATE POLYMEGATHISM - SLIGHT INCREASE
118	OD	3200	3200	SLIGHT POLYMEGATHISM - SMALL INCREASE
118	OS	3200	3200	SLIGHT POLYMEGATHISM - SMALL INCREASE
119	0D	2800	2800	SLIGHT TO MODERATE POLYMEGATHISM - SMALL INCREASE
119	OS	2800	2800	SLIGHT TO MODERATE POLYMEGATHISM - SMALL INCREASE
120	OD	3000	3000	MODERATE TO SEVERE - SMALL INCREASE
120	OS	3000	3000	MODERATE TO SEVERE - SMALL INCREASE
121	OD	2600	2600	MODERATE POLYMEGATHISM - SMALL INCREASE
121	OS	2600	2600	MODERATE POLYMEGATHISM - SMALL INCREASE
122	OD	2500	2500	NORMAL TO SLIGHT - NO SIGNIFICANT CHANGE
122	OS	2500	2500	NORMAL TO SLIGHT - NO SIGNIFICANT CHANGE
123	OD	2600	2600	MODERATE POLYMEGATHISM - SLIGHT INCREASE
123	OS	2600	2600	MODERATE POLYMEGATHISM - SLIGHT INCREASE
126	OD	2600	2600	NORMAL TO SLIGHT - NO SIGNIFICANT CHANGE
126	OS	2400	2500	NORMAL TO SLIGHT - NO SIGNIFICANT CHANGE
129	OD	2800	2800	MODERATE POLYMEGATHISM - SLIGHT INCREASE
129	OS	2800	2800	MODERATE POLYMEGATHISM - SLIGHT INCREASE
130	OD	3100	3100	SLIGHT TO MODERATE POLYMEGATHISM - SMALL INCREASE
130	OS	3100	3100	SLIGHT TO MODERATE POLYMEGATHISM - SMALL INCREASE
132	OD	2400	2400	MODERATE POLYMEGATHISM - SLIGHT INCREASE
132	OS	2400	2400	MODERATE POLYMEGATHISM - SLIGHT INCREASE
133	OD	2900	2800	MODERATE POLYMEGATHISM - SLIGHT INCREASE
133	OS	2800	2800	MODERATE POLYMEGATHISM - SLIGHT INCREASE
134	OD	2900	2900	SLIGHT POLYMEGATHISM - SMALL INCREASE
134	OS	2900	2900	SLIGHT POLYMEGATHISM - SMALL INCREASE
135	OD	2900	2900	SLIGHT POLYMEGATHISM - SMALL INCREASE
135	OS	2900	2900	SLIGHT POLYMEGATHISM - SMALL INCREASE
136	OD	3100	3100	MODERATE POLYMEGATHISM - SLIGHT INCREASE

136	OS	3100	3100	MODERATE POLYMEGATHISM - SLIGHT INCREASE
137	OD	3000	3000	MODERATE POLYMEGATHISM - SLIGHT INCREASE
137	OS	3000	3000	MODERATE POLYMEGATHISM - SLIGHT INCREASE
139	OD	2800	2800	MODERATE TO SEVERE - SMALL INCREASE
139	OS	2800	2800	MODERATE TO SEVERE - SMALL INCREASE

PT. NO.	EYE	DAY 0 # CELLS	DAY 120 # CELLS	NOTES CELLS RATED - CHANGE NOTED
301	OD	3000	3000	MODERATE POLYMEGATHISM - NO CHANGE
301	OS	3000	3000	MODERATE POLYMEGATHISM - NO CHANGE
303	OD	3100	3100	NORMAL - NO CHANGE
303	OS	3100	3100	NORMAL - NO CHANGE
304	OD	3100	3100	NORMAL - NO CHANGE
304	OS	3100	3100	NORMAL - NO CHANGE
305	OD	2800	2800	SLIGHT TO MODERATE POLYMEGATHISM - NO CHANGE
305	OS	2800	2800	SLIGHT TO MODERATE POLYMEGATHISM - NO CHANGE

ENDOTHELIAL COUNT

STATISTICAL DATA
DAY 0 VS. DAY 150

One Way ANOVA 2 Groups

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	4711.538	4711.538	.079
Wihin groups	102	6120576.923	60005.656	p > .25
Total	103	6125288.462		

Model II estimate of between component variance = -1063.348

Group:	Count:	Mean:
Column 1	52	2886.538
Column 2	52	2900

ENDOTHELIAL COUNT

STATISTICAL DATA
DAY 150

Column 2

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
2900	244.147	33.857	59607.843	8.419	52
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum Squared:**	**# Missing:**
2400	3300	900	150800	440360000	0
Median:	**Mode:**	**Geo. Mean:**	**Har. Mean:**	**Kurtosis:**	**Skewness:**
2900	2800	2889.714	2879.231	-.884	-.261

FREQUENCY DISTRIBUTION

Column 2

Bar:	From: (≥)	To: (<)	Count:	Percent:	
1	2400	2490.1	2	3.846	
2	2490.1	2580.2	3	5.769	
3	2580.2	2670.3	5	9.615	
4	2670.3	2760.4	2	3.846	
5	2760.4	2850.5	12	23.077	-Mode
6	2850.5	2940.6	5	9.615	
7	2940.6	3030.7	5	9.615	
8	3030.7	3120.8	8	15.385	
9	3120.8	3210.9	8	15.385	
10	3210.9	3301	2	3.846	

ENDOTHELIAL COUNT
CONTROL PATIENTS

STATISTICAL DATA

Column 1

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
3000	130.931	46.291	17142.857	4.364	8
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum Squared:**	**# Missing:**
2800	3100	300	24000	72120000	0
Median:	**Mode:**	**Geo. Mean:**	**Har. Mean:**	**Kurtosis:**	**Skewness:**
3050	3100	2997.441	2994.825	-1	-.816

FREQUENCY DISTRIBUTION

Column 1

Bar:	From: (≥)	To: (<)	Count:	Percent:	
1	2800	2830.1	2	25	
2	2830.1	2860.2	0	0	
3	2860.2	2890.3	0	0	
4	2890.3	2920.4	0	0	
5	2920.4	2950.5	0	0	
6	2950.5	2980.6	0	0	
7	2980.6	3010.7	2	25	
8	3010.7	3040.8	0	0	
9	3040.8	3070.9	0	0	
10	3070.9	3101	4	50	-Mode

APPENDIX K

KEYSTONE DIAGNOSTIC TESTING - AVIATORS UNIT

EXPLANATION OF ABBREVIATIONS ON FOLLOWING PAGE

PT. # = PATIENT NUMBER
PRE S # = PRETEST HIGH SCORE CARD NUMBER
% S = PERCENT STEREOPSIS
SEC = SECONDS OF ARC

POST S # = POSTTEST (WITH SPECTACLE Rx) HIGH SCORE CARD NUMBER
P % S = POSTTEST (WITH SPECTACLE Rx) PERCENT STEREOPSIS
POST SEC = POSTTEST (WITH SPECTACLE Rx) SECONDS OF ARC

CL S # = POSTTEST (WITH CONTACT LENS) HIGH SCORE CARD NUMBER
CL % S = POSTTEST (WITH CONTACT LENS) PERCENT STEREOPSIS
CL SEC = POSTTEST (WITH CONTACT LENS) SECONDS OF ARC

XXX = NOT TAKEN

PT. #	PRE S #	% S	SEC	POST S #	P % S	POST SEC	CL S #	CL % S	CL SEC
101	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
102	48	85	32	49	90	26	48	85	32
103	38	35	175	43	60	75	42	55	80
104	44	65	65	46	75	45	45	70	55
105	42	55	80	44	65	65	41	50	85
106	48	85	32	48	85	32	47	80	39
107	45	70	55	47	80	39	46	75	45
108	47	80	39	47	80	39	48	85	32
109	48	85	32	49	90	26	49	90	26
110	46	75	45	XXX	XXX	XXX	XXX	XXX	XXX
111	46	75	45	45	70	55	45	70	55
112	48	85	32	48	85	32	48	85	32
113	43	60	75	42	55	80	42	55	80
114	44	65	65	44	65	65	47	80	39
115	47	80	39	48	85	32	48	85	32
116	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
117	46	75	45	48	85	32	46	75	45
118	46	75	45	46	75	45	46	75	45
119	48	85	32	49	90	26	46	75	45
120	47	80	39	48	85	32	47	80	39
121	45	70	55	46	75	45	45	70	55
122	44	65	65	46	75	45	44	65	65
123	47	80	39	51	100	19	48	85	32
124	47	80	39	47	80	39	47	80	39
125	40	45	115	48	85	32	49	90	26
126	46	75	45	46	75	45	46	75	45
127	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
128	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
129	45	70	55	44	65	65	46	75	45
130	39	40	140	42	55	80	44	65	65
131	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
132	44	65	65	44	65	65	44	65	65
133	43	60	75	47	80	39	45	70	55
134	39	40	140	39	40	140	40	45	115
135	41	50	85	42	55	80	44	65	65
136	48	85	32	49	90	26	48	85	32
137	44	65	65	46	75	45	46	75	45
138	38	35	175	39	40	140	38	35	175
139	37	30	210	38	35	175	37	30	210